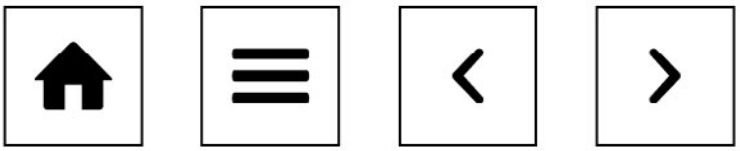
SPECIAL ISSUE: FALL 2020

The Great Disruption: COVID-19 and the Global Health Crisis

THE Zambakari ADVISORY



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The Zambakari Advisory team extends its sincere appreciation to everyone who worked on this Special Issue. The contributors listed below share our passion and enthusiasm for the work we do to provide solutions to a changing world: authors Marc Lipsitch, John P. A. Ioannidis, Jonathan Fuller, Graham E. Fuller, Dirk Hansohm, Asha Abdel Rahim, Rose Jaji and Paul Gormley; the Boston Review and its editorial team; Advisory editorial and production team members Matthew Edwards, Steve Des Georges, Jessica Petney, Estève Giraud and Giada Mannino.

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COVID-19 and the Great Disruption

An Introduction

Christopher Zambakari, MBA, M.I.S., LP.D.
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We – all of us, globally – are in unprecedented times.

In December 2019 and January 2020, a viral illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1] – or simply called coronavirus disease 2019 (COVID-19) – was sweeping through Wuhan, Hubei Province, China.[2] COVID-19 is spread mainly through close contact from person-to-person.[3] It is structurally related to the virus that causes severe acute respiratory syndrome (SARS). The respiratory illness caused by the new coronavirus has been particularly dangerous for older adults and people of any age who have serious underlying medical conditions.

The current pandemic crisis is extraordinary in regard to the speed of its spread, its economic disruption and overall global impact. It has struck a devastating blow to an already-fragile global economy while exacting a terrible cost in human lives.

[1] According to Glaunsinger, et. al. (2020) "The SARS-CoV-2 genome is a strand of RNA that is about 29,900 bases long – near the limit for RNA viruses. Influenza has about 13,500 bases, and the rhinoviruses that cause common colds have about 8,000."

[2] Li, Qun, Xuhua Guan, Peng Wu, Xiaoye Wang, Lei Zhou, Yeqing Tong, Ruiqi Ren, et al. 2020. "Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia." *New England Journal of Medicine.*

[3] Thompson, Lindsay A., and Sonja A. Rasmussen. 2020. "What Does the Coronavirus Disease 2019 (COVID-19) Mean for Families?" *JAMA Pediatrics* 174 (6):628-628. doi: 10.1001/jamapediatrics.2020.0828.

In March 2020, the health crisis precipitated an unprecedented collapse in oil demand around the world, posting the steepest one-month decline in oil prices on record. Very few analysts fully understood the great upheaval brought about by the coronavirus. The ultimate economic impact, not fully known at this moment, is expected to further depress financial markets, future growth and possibly lead to a global recession.[4] In the words of Liz Ann Sonders, chief investment strategist at Charles Schwab, "We have a monster mash-up of the Great Depression in size, the crash of 1987 in speed, and the 9-11 attack in terms of fear."[5] The International Monetary Fund predicts a tight contraction in the global economy: for the remainder of 2020, the global economy is forecast to shrink by 3 percent (an outcome far worse than during the 2009 global financial crisis), advanced economies by 6.1 percent, U.S. economy by 5.9 percent, European Union economies by 7.5 percent,[6] followed by a Euro zone recession of up to 7.7 percent.[7]

Few countries are spared from economic contraction in 2020. In fact most advanced economies are forecast to shrink this year, including Japan (–5.2 percent), the United Kingdom (–6.5 percent), Germany (–7.0 percent), France (–7.2 percent), Italy (–9.1 percent) and Spain (–8.0 percent).[8]

In the U.S., the pandemic drove up the numbers of people who filed for unemployment benefits; that count reached 30 million[9] within the first week of the pandemic – by the end of April 2020 the unemployment rate had reached a whopping 13.3 percent.

[4] World Bank. 2020. *Global Economic Prospects, June 2020, Global Economic Prospects*. Washington, DC: World Bank. Accessible from https://openknowledge.worldbank.org/handle/10986/33748.

[5] Martin, Katie. 2020. "Investors baffled by soaring stocks in 'monster' epression." *DNyuz* (blog). April 24, 2020. https://dnyuz.com/2020/04/24/investors-baffled-by-soaring-stocks-in-monster-depression/.

[6] The International Monetary Fund (IMF). 2020. "World Economic Outlook, April 2020: The Great Lockdown." IMF. April 2020. https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020.

[7] Martinez, Laurence Norman and Maria. 2020. "Coronavirus Projected to Send Eurozone Into Steep Recession." *Wall Street Journal*, May 6, 2020, sec. World. https://www.wsj.com/articles/coronavirus-projected-to-send-eu-rozone-into-steep-recession-11588761057.

[8] *Ibid*, see chapter 2, page 5

[9] Gortsos, Christos, and Wolf-Georg Ringe, eds. 2020. *Pandemic Crisis and Financial Stability, Working Paper Series*. Frankfurt, Germany: European Banking Institute. Available at SSRN: https://ssrn.com/abstract=3607930.

The disruption that has come to characterize 2020 has taken the world by surprise. No industry has been left untouched. From air travel to schools, and from personal business to other activities of daily living, all have been impacted. One recent estimate notes that U.S. universities are expected to lose $45 billion in tuition revenue due to lower enrollments next fall.[10] The coronavirus is disrupting global interconnectedness in ways that are hard to fully understand. It has already caused disruption and interruption in the flow of workers, money and goods that increasingly bind the postwar world.[11]

The novel coronavirus has accelerated the rise of nationalism around the world and pressed a pause on rapid globalization, while sickening more than 10 million people and killing upwards of 512,000 around the world as of July 1, 2020. At the same time, the United States, which has become the epicenter of the pandemic, listed some 2.7 million confirmed cases of the virus and nearly 130,000 deaths.[12] Preliminary results released by the Centers for Disease Control and Prevention indicate that the number of confirmed infections in many regions[13] of the U.S. are probably 10 times greater than reported.[14]

[10] Korn, Melissa, Douglas Belkin, and Juliet Chung. 2020. "Coronavirus Pushes Colleges to the Breaking Point, Forcing 'Hard Choices' About Education - WSJ." Accessed June 30, 2020. https://www.wsj.com/articles/coronavirus-pushes-colleges-to-the-breaking-point-forcing-hard-choices-about-education-11588256157?mod=d-jemwhatsnews.

[11] Faiola, Anthony, and Graphics by Lauren Tierney and William Neff. 2020. "The Virus That Shut down the World." 2020. Washington Post. Accessed on July 1, 2020. https://www.washingtonpost.com/graphics/2020/world/coronavirus-pandemic-globalization/.

[12] "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)." 2020. Johns Hopkins Coronavirus Resource Center. 2020. https://coronavirus.jhu.edu/map.html.

[13] Researchers tested de-identified clinical blood specimens collected in Connecticut, south Florida, the New York City metro area, Missouri, Utah and western Washington state for SARS-CoV-2 antibodies. According to the study, "Estimates ranged from 1.9% in south Florida to 4.9% in Connecticut with specimens collected during intervals from April 6-May 3. Six to 24 times more infections were estimated per site with seroprevalence than with case report data." See Fiona P. Havers, Carrie Reed, Travis Lim, Joel M. Montgomery, John D. Klena, Aron J. Hall, Alicia M. Fry, et al. 2020. "Seroprevalence of Antibodies to SARS-CoV-2 in Six Sites in the United States, March 23-May 3, 2020." Centers for Disease Control and Prevention. February 11, 2020. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/commercial-lab-surveys.html.

[14] Fiona P. Havers, Carrie Reed, Travis Lim, Joel M. Montgomery, John D. Klena, Aron J. Hall, Alicia M. Fry, et al. 2020. "Seroprevalence of Antibodies to SARS-CoV-2 in Six Sites in the United States, March 23-May 3, 2020." Centers for Disease Control and Prevention. February 11, 2020. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/commercial-lab-surveys.html.

In many places around the world, effective intervention coupled with mitigation strategies has helped to flatten incidence curves. However, vulnerable populations continue to bear the brunt of the virus. Globally, many questions remain as we head into the fall and winter about effective treatments, the ultimate discovery of a vaccine, the duration of immunity from the virus, and whether there will be any semblance of normalcy moving forward. The viral outbreak is a stark reminder that there is no good substitute to proper planning; the health and safety of humanity is connected through a fragile thread and globalization has ensured that an outbreak anywhere in the world can quickly become a pandemic everywhere.

According to analysts at the World Bank, the impact of COVID-19 on global poverty could be far worse than what was earlier anticipated – a startling projection that estimated between 71 and 100 million people would spiral into extreme poverty in 2020, in baseline and downside scenarios, respectively.[15] In Africa – where many countries depend on the exportation of commodities, the extraction of natural resources for shipment abroad and foreign exchange revenue – the looming recession portends a devastating impact on the livelihoods of many on the continent.[16]

Several questions remain as each country devises a different containment strategy, each capable of managing the most delicate balance between restricting economic activities and contagion mitigation. How will each country respond to the severe economic contraction ahead while managing the fiscal deficit expected to follow in the wake of the pandemic? Absent an effective vaccine, how will states manage the negative economic impact while keeping people employed? Will current medical infrastructure be adequate to handle the remainder of the caseload in 2020 and the possible convergence of COVID-19 with seasonal influenzas?

More than 100 drugs to fight COVID-19 are under investigation by commercial and

[15] The World Bank Group. 2020. "Projected Poverty Impacts of COVID-19 (Coronavirus)." Text/HTML. World Bank. Accessed June 30, 2020. https://www.worldbank.org/en/topic/poverty/brief/projected-poverty-impacts-of-COVID-19.

[16] Harvey, Ross, and Sixolile Ngqwala. 2020. The Likely Impact of COVID-19 on the Extractive Industries and its Governance Implications. Johannesburg, South Africa: Good Governance Africa. Accessible from https://gga.org/covid-19-5/.

university labs around the world.[17] The lengthy and time-consuming nature of clinical trials makes it difficult to imagine that we will realize an effective vaccine until late 2021.

The challenge posed by COVID-19 presents the world with an unexpected opportunity to use the pandemic and the lessons being learned along the way to develop better mechanism for future outbreaks. It reminds us to be ever-vigilant, to integrate disease forecasting into decisionmaking, to invest in research and better infrastructure to understand the basic biology of new organisms and, above all, to find a sustainable way to coexist with the environment and develop effective countermeasures for the future.

The Zambakari Advisory is proud to present our Fall 2020 Special Issue: "The Great Disruption: *COVID-19 and the Global Health Crisis*." To produce a quality perspective and shine a nuanced light on this health crisis, we invited prominent scholars, medical doctors, epidemiologist and social scientists to share with you the evolving pandemic as it is seen and experienced and battled around the world. Whereas much still remains unknown, untested and unpredictable, only by committing to an all-encompassing, all-inclusive, multidisciplinary approach can we begin to fight back successfully. While we encounter and try to understand new evolutions in the virus and our treatment of it, this is not the first time the world has been confronted with such a challenge. Our universality has provided the coronavirus with more rapid transmission opportunities than ever before, but we cannot turn our backs on the broad lessons we have learned from our fights against such vicious 20th-century killers as the Spanish (1918-20) and Asian (1957-58) flus, the HIV virus that causes AIDS (1981-present), the H1N1 swine flu (2009-10), the West Africa Ebola pandemic (2014-16) and the Zika virus in South and Central America (2015-present).

This issue's collection features seven articles contributed by such respected voices as Marc Lipsitch, John P. A. Ioannidis, Jonathan Fuller, Graham E. Fuller, Dirk Hansohm, Asha Abdel Rahim, Rose Jaji and Paul Gormley.

[17] Glaunsinger, Mark Fischetti, Veronica Falconieri Hays, Britt. 2020. "Inside the Coronavirus." Scientific American. Accessed June 28, 2020. https://www.scientificamerican.com/interactive/inside-the-coronavirus/.

In the first paper, a professor of epidemiology at Harvard University's T. H. Chan School of Public Health, Marc Lipsitch, writes that we "should use every possible source of insight at our disposal to gain knowledge and inform decisions, which are always made under uncertainty — rarely more so than at present" when faced with the complexities of the COVID-19 pandemic.

Next up, F. Rehnborg Professor in Disease Prevention in the School of Medicine, and a professor of epidemiology at Stanford University, John Ioannidis offers timely insight, noting that "failing to correct our ignorance and adapt our actions as quickly as possible is not good science. Nor is politicizing scientific disagreement or looking away from the undeniable harms of our well-intentioned actions."

The University of Pittsburgh's Jonathan Fuller, assistant professor of history and the philosophy of science, takes his turn next, writing that epidemiology "must be split-brained, acting with one hand while collecting more information with the other. Only by borrowing from both ways of thinking will we have the right mind for a pandemic."

In the fourth paper, Graham E. Fuller, a former senior CIA official and former vice chairman of the National Intelligence Council at the CIA, contributes to our Fall Issue with a look at the COVID-19 pandemic and a warning that "It would be too bad if all we aspire to is only to return to business as usual once this particular virus has been beaten back."

Following Fuller's thoughts, co-contributors Dirk Hansohm and Asha Abdel Rahim explore the ingredients necessary to combat COVID-19, including quality governance, interdisciplinary research, international cooperation, an EU offer of support to the countries of Africa and more. The authors offer that, at best, "the world in Europe and beyond will not return to the same state as it was before."

In the sixth paper, a senior lecturer in the Department of Sociology at the University of Zimbabwe, Rose Jaji writes, "It is time for Africa to be proactive and to actively participate in finding solutions for itself instead of waiting for richer nations to assist." In her article, she looks at the challenges African countries face in battling the pandemic, especially in light of their limited resources.

The final piece is penned by Paul Gormley, a professor of criminal justice

administration and chair in social science at Lynn University in Boca Raton, Florida. Gormley contributes his thoughts on the COVD-19 pandemic and, specifically, how the correctional system and its actors are at risk. He concludes that, short of "herd immunity" or a vaccine, the system as it exists and operates today is in danger of being "crushed."

I hope that this special issue and the work done by our valued experts will provide you with a better understanding – as seen through the thoughts and perspectives of others – of the evolving health crisis, its economic impact and the ways we can design an effective intervention to halt the spread of the virus while also working on an effective vaccine. In the words of epidemiologist Michael T. Osterholm and American author Mark Olshaker, "If the world doesn't learn the right lessons from its failure to prepare and act on them with the speed, resources, and political and societal commitment they deserve, the toll next time could be considerably steeper."[18] The pandemic is teaching us that the failure to prepare usually leads to the failure to contain. If we want to manage future infectious disease outbreaks, then we need to invest in prevention and preparedness for what certainly is going to be a recurring viral outbreak in the future. My wish is that this special issue provides you, our valued reader, with additional tools and resources to better operate in an increasingly complex health climate.

About the Author

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[18] Osterholm, Michael T., and Mark Olshaker. 2020. "Chronicle of a Pandemic Foretold." *Foreign Affairs* 99 (4): 9–24.

Good Science is Good Science[1]

Image credit: angellodeco / Shutterstock.com

Marc Lipsitch, Ph.D.
Professor of Epidemiology, Harvard T. H. Chan School of Public Health; Director, Center for Communicable Disease Dynamics, Harvard T. H. Chan School of Public Health

The Brazilian-British biologist Peter Medawar won the Nobel Prize in 1960 for his study of acquired immune tolerance. Beyond his scientific work, he was also a gifted writer and expositor of scientific culture. One of the many treasures of his "Advice to a Young Scientist" (1979) is a passage in his chapter on "Aspects of Scientific Life and Manners," in which he discusses "techniques used in the hope of enlarging one's reputation as a scientist or diminishing the reputation of others by nonscientific means."

One such "trick," Medawar writes, "is to affect the possession of a mind so finely critical that no evidence is ever quite good enough ('I am not very happy about….'; 'I must say I am not at all convinced by…')." After all, as he writes in a different

[1] This article was first published by The Boston Review on May 12, 2020, and is republished with permission from The Boston Review and Marc Lipsitch.

passage, "no hypothesis in science and no scientific theory ever achieves ... a degree of certainty beyond the reach of criticism or the possibility of modification."

> **Scientists must resist the temptation to excessive skepticism: the kind that says no evidence is ever quite good enough. Instead they should keep their eyes open for any kind of information that can help them solve problems.**

I share Medawar's pragmatic vision of scientific reasoning. Scientists must resist the temptation to excessive skepticism: the kind that says no evidence is ever quite good enough. Instead, they should keep their eyes open for any kind of information that can help them solve problems. Deciding, on principle, to reject some kinds of information outright, or to consider only particular kinds of studies, is counterproductive. Instead of succumbing to what Medawar calls "habitual disbelief," the scientist should pursue all possible inputs that can sharpen one's understanding, test one's preconceptions, suggest novel hypotheses, and identify previously unrecognized inconsistencies and limitations in one's view of a problem.

This conception of science leads me to disagree with some elements of the philosopher of medicine Jonathan Fuller's recent essay[2] about two sects within epidemiology, defined by what kinds of evidence they consider meaningful and how they think decisions should be made when evidence is uncertain. Fuller sees in the contrast two "competing philosophies" of scientific practice. One, he says, is characteristic of public health epidemiologists like me, who are "methodologically liberal and pragmatic" and use models and diverse sources of data. The other, he explains, is characteristic of clinical epidemiologists like Stanford's John Ioannidis, who draw on a tradition of skepticism about medical interventions in the literature of what has been known since the 1980s as "evidence-based medicine," privilege "gold standard" evidence from randomized controlled trials (as opposed to mere "data"), and counsel inaction until a certain ideal form of

2 Fuller, Jonathan. 2020. "Models v. Evidence." Text. Boston Review. May 1, 2020. http://bostonreview.net/science-nature/jonathan-fuller-models-v-evidence.

evidence — Evidence with a capital E — justifies intervening.

Fuller rightly points out that this distinction is only a rough approximation; indeed, there are many clinical epidemiologists who do not share the hardline skepticism associated with the most extreme wing of the evidence-based medicine community. But the distinction is also misleading in a subtle way. If the COVID-19 crisis has revealed two "competing" ways of thinking in distinct scientific traditions, it is not between two philosophies of *science* or two philosophies of *evidence* so much as between two philosophies of *action*.

> **If the COVID-19 crisis has revealed two "competing" ways of thinking, it is not between two philosophies of *science* or two philosophies of *evidence* so much as between two philosophies of *action*.**

In March, as health systems in Wuhan, Iran and Northern Italy teetered under the weight of COVID-19 cases, Ioannidis cautioned[3] that we really didn't know enough to say whether a response was appropriate, warning of a "once-in a-century evidence fiasco" and suggesting that the epidemic might dissipate "on its own." (I replied to that argument, explaining why we do know enough to act decisively against this pandemic.)[4] To my knowledge, Ioannidis has never stated that early interventions should have been avoided, but by repeatedly criticizing the evidence on which they were based, he gives that impression.

On the question of how we interpret evidence, Fuller concludes that to understand the scientific disagreements being aired about COVID-19, we need to blend the insights of each camp. "Cooperation in society should be matched by cooperation across disciplinary divides," he writes. I don't understand what this kind of both-sidesism means when one side is characterized as accepting many types of evidence and the other as insisting on only certain kinds. On the question of how

[3] Ioannidis, John. 2020. "In the Coronavirus Pandemic, We're Making Decisions without Reliable Data." STAT. March 17, 2020. https://www.statnews.com/2020/03/17/a-fiasco-in-the-making-as-the-coronavirus-pandemic-takes-hold-we-are-making-decisions-without-reliable-data/.

[4] Lipsitch, Marc. 2020. "We Know Enough Now to Act Decisively against Covid-19." STAT. March 18, 2020. https://www.statnews.com/2020/03/18/we-know-enough-now-to-act-decisively-against-covid-19/.

we should make decisions under uncertainty, of course more data are better. But decisions are urgent and must be made with the evidence we've got.

This is not to deny that there are different and valuable perspectives on epidemiology. Like any other field, there are many specialties and subspecialties. They have different methods for how they study the world, how they analyze data, and how they filter new information. No one person can keep up with the flood of scientific information in even one field, and specialization is necessary for progress: Different scientists need to use different approaches given their skills, interests, and resources. But specialization should not lead to sects — in this case, a group of scientists who accept only certain kinds of evidence and too rigidly adhere to a philosophy of non-interventionism.

Infectious disease epidemiologists must embrace diverse forms of evidence by the very nature of their subject. We study a wide range of questions: how and under what conditions infectious diseases are transmitted, how pathogens change genetically as they spread among populations and across regions, how those changes affect our health, and how our immune systems protect us and, sometimes, make us vulnerable to severe illness when immune responses get out of control. We also seek to understand what kinds of control measures are most effective in limiting transmission. To understand these issues for even *one* type of disease — say, coronavirus diseases — requires drawing on a wide range of methodologies and disciplines.

> **On the question of how we should make decisions under uncertainty, of course more data are better. But decisions are urgent and must be made with the evidence we've got.**

We consider evidence from classical *epidemiological* studies of transmission in households and other settings. We consider *immunological* studies that show us how markers of immunity develop, whether they protect us against future disease, and how particular markers (say a certain type of antibody directed at a certain part of the virus) change infection and mortality rates. We consider *molecular genetics* experiments, including those conducted in animal models, that tell us how changes in a virus's genome affect the course of disease. We consider evolutionary patterns in the virus's genetic code, seasonal patterns in

its transmission and that of other related viruses, and observational studies of the risk factors and circumstances favoring transmission. And, of course, we also consider randomized trials of treatments and prevention measures, when they exist, as we seek to understand which interventions work and which ones may do more harm than good.

> **The upshot is that, done well, epidemiology synthesizes many branches of science using many methods, approaches, and forms of evidence. No one can be expert in all of these specialties, and few can even be conversant in all of them. But a scientist should be open to learning about all of these kinds of evidence and more.**

Thinking about evidence from diverse specialties is critical not only for weighing evidence and deciding how to act but also for developing hypotheses that, when tested, can shed light across specialties. Appropriate humility dictates that molecular virologists should not assume they are experts in social epidemiology, and vice versa. To say "I'm a virologist, so I'm not going to account for any findings from social epidemiology in my work" gives up the chance to understand the world better.

Here's an example. In the case of a new virus like SARS-CoV-2, the fact that socioeconomically disadvantaged people get sick more often than the wealthy gives clues, which we don't yet know how to interpret, about the way the virus interacts with hosts. It would be informative to a virologist to distinguish the following two hypotheses (among others): (a) exposure to high doses of virus tends to cause severe disease, and disadvantaged people are often exposed to higher doses due to confined living and working conditions, or (b) comorbidities such as heart disease and obesity are higher among disadvantaged people, and lead to more severe outcomes. Of course, either, both, or neither of these hypotheses may turn out to be important explanations, but the canny virologist should wonder and think about how to distinguish them experimentally and test results against data from human populations. Reciprocally, a canny social epidemiologist should look to virological studies for clues about why COVID-19, like so many other illnesses, disproportionately harms the least advantaged in our society.

Done well, epidemiology synthesizes many branches of science. No one can be

expert in all of these specialties, and few can even be conversant in all of them, but a scientist should be open to learning about all of these kinds of evidence — and more.

In practice, virologists, immunologists and epidemiologists are different specialists who often work far apart and almost never attend each other's seminars. I do not think we should spend all our time learning each other's disciplines. But I do think that a scientist who genuinely wants to solve an important problem should be open to evidence from many sources, should welcome the opportunity to expand their list of hypotheses, and should seek to increase their chances both of making a novel contribution to their field and of being right. Central to this effort is considering information from diverse kinds of studies performed by people with diverse job titles in diverse departments of the university — as well as their diverse forms of data and argumentation.

When we move from the realm of understanding to the realm of intervention, the need for openness to different sources of evidence grows further. In some cases, like whether to use a drug to treat infection or whether to use a mask to prevent transmission, we can draw on evidence from experiments, sometimes even randomized, controlled, double-blind experiments. But in deciding whether to impose social distancing during an outbreak of a novel pathogen — and in thinking about how the course of the epidemic might play out — it would be crazy not to consider whatever data we can, including from mathematical models and from other epidemics throughout history. With infectious diseases, especially new and fast-spreading pandemics, action can't wait for the degree of evidentiary purity we get from fully randomized and controlled experiments, or from the ideal observational study. At the same time, we must continue to improve our understanding while we act and change our actions as our knowledge changes — leaving both our beliefs and our actions open, as Medawar says, to the reach of criticism and the possibility of modification.

Where does the skepticism so characteristic of the evidence-based tradition come from? One reason may be the habits and heuristics we absorb from textbooks, colleagues, and mentors.

In supervising students and postdocs, inculcating these habits is one of the most

challenging, gratifying, and time-consuming parts of scientific training — far more than teaching technical skills. Some of these rules of thumb are well suited to science in general and serve us well throughout our careers, no matter the field. Among these are workaday but important heuristics like: Consider alternative hypotheses; look at raw data whenever possible before looking at processed data; and repeat experiments, especially those whose results surprise you. Indeed, these heuristics can be summarized as a form of intense skepticism directed at one's *own* work and that of one's team: Find all the flaws you can before someone else does; fix those you can and highlight as limitations those which are unfixable. Recently, an advanced Ph.D. student said to me: "I read your new idea that you shared on Slack this morning, and I've been doing my best all afternoon to break it." It made my day, and made me think I probably had very little left to teach her.

> **Scientists of all stripes should work together to improve public health, and none should mistake a professional tendency or a specialist's rule of thumb for an unshakable epistemological principle.**

Other heuristics, however, are more specific to a narrow field and may be ill suited to other contexts. Insisting on gold standard, randomized trial evidence before prescribing drugs to prevent heart attacks or *before* performing a certain surgical operation may be a good rule of thumb in medicine (though not all physicians or even philosophers agree). But randomized controlled trials are not available for huge swaths of scientific inquiry, and the narrow populations often studied in such trials can limit their applicability to real-world decision making. Nor are they always available when we need them: they require a lot of time and administrative resources to execute (and money, for that matter). Stumping for Evidence is thus useful in many parts of clinical medicine but impractical in many other aspects of science-informed decision making. Applying this doctrine indiscriminately across all areas of science turns the tools of a specialist into the weapons of a sectarian.

This point was appreciated by some of the pioneers of evidence-based medicine: David Sackett, William Rosenberg, J. A. Muir Gray, R. Brian Haynes and W. Scott Richardson. "Evidence-based medicine is not restricted to randomized trials

and meta-analyses," they wrote in 1996.[5] "It involves tracking down the best external evidence with which to answer our clinical questions." And (in May of this year), the Oxford professor of primary care, Trisha Greenhalgh, another major contributor to this field and author of a popular textbook on evidence-based medicine, suggested that in the realm of social interventions to control the spread of COVID-19, the evidence-based clinical paradigm — "waiting for the definitive [randomized controlled trial] before taking action" — "should not be seen as inviolable, or as always defining good science."[6]

Indeed, on the question of how we ought to act during an outbreak, two leading epidemiologists in the clinical tradition, Hans-Olov Adami and the late Dimitrios Trichopoulos,[7] argued that the non-interventionist rule of thumb is suitable for chronic, noncommunicable diseases but foolish for fast-moving infectious diseases. In an editorial accompanying an article that showed that the impact of cell phones in causing brain cancer was not large but might be larger than zero, they counseled "cautious inaction" in regulating cell phones. But they noted this is not how you would reason in the case of a transmissible disease:

> **There is another lesson to be learned about the alarms that have been sounded about public health during the past few years. When the real or presumed risk involves communicable agents, such as the prions that cause bovine spongiform encephalopathy (mad cow disease), no precaution, however extreme, can be considered excessive. By contrast, for noncommunicable agents, such as radio-frequency energy, the lack of a theoretical foundation and the absence of empirical evidence of a substantial increase in risk legitimize cautious inaction, unless and until a small excess risk is firmly documented.**

In my ideal public health world we'd have a lot more good sense like that proposed

[5] Sackett, D. L, W. M C Rosenberg, J A M. Gray, R B. Haynes, and W S. Richardson. 1996. "Evidence Based Medicine: What It Is and What It Isn't." BMJ 312 (7023): 71–72. https://doi.org/10.1136/bmj.312.7023.71.

[6] Greenhalgh, Trisha. 2020. "Https://Twitter.Com/Trishgreenhalgh/Status/1256487624346341376." Twitter. May 2, 2020. https://twitter.com/trishgreenhalgh/status/1256487624346341376.

[7] Trichopoulos, Dimitrios, and Hans-Olov Adami. 2001. "Cellular Telephones and Brain Tumors." *New England Journal of Medicine* 344 (2): 133–34. https://doi.org/10.1056/nejm200101113440209.

by Adami and Trichopoulos, acting not only on the strength of the evidence we have but on the relative harms of being wrong in each direction. And whether waiting or acting, we'd work hard to get the evidence to meet the challenges of skeptics and improve our decision-making, all with an eye to the possibility of criticism and modification Medawar describes.

What does all this mean for the COVID-19 crisis? Scientists of all stripes should work together to improve public health, and none should mistake a professional tendency or a specialist's rule of thumb for an unshakable epistemological principle. All should support rigorous evidence gathering, especially for the costliest and most disruptive interventions. And insofar as scientists identify with a philosophical school that predisposes them to write off certain forms of evidence entirely, they should, in short, get over it. Instead we should use every possible source of insight at our disposal to gain knowledge and inform decisions, which are always made under uncertainty — rarely more so than at present.

About the Author

Marc Lipsitch is a professor of epidemiology with primary appointment in the Department of Epidemiology and a joint appointment in the Department of Immunology and Infectious Diseases at the T. H. Chan School of Public Health at Harvard University, where his wet lab is located. He directs the Center for Communicable Disease Dynamics, a center of excellence funded by the MIDAS program of NIH/NIGMS. He is also the associate director of the Interdisciplinary Concentration in Infectious Disease Epidemiology.

Holding a B.A. in philosophy from Yale and his Ph.D. in zoology from the University of Oxford, Lipsitch's research concerns the effect of naturally acquired host immunity, vaccine-induced immunity and other public health interventions (e.g., antimicrobial use) on the population biology of pathogens and the consequences of changing pathogen populations for human health. Some of this work is motivated mainly by practical questions in public health (such as vaccine design and intervention targeting), and some is motivated by classical questions in population biology, such as how to explain patterns of coexistence of pathogen strains in space and time.

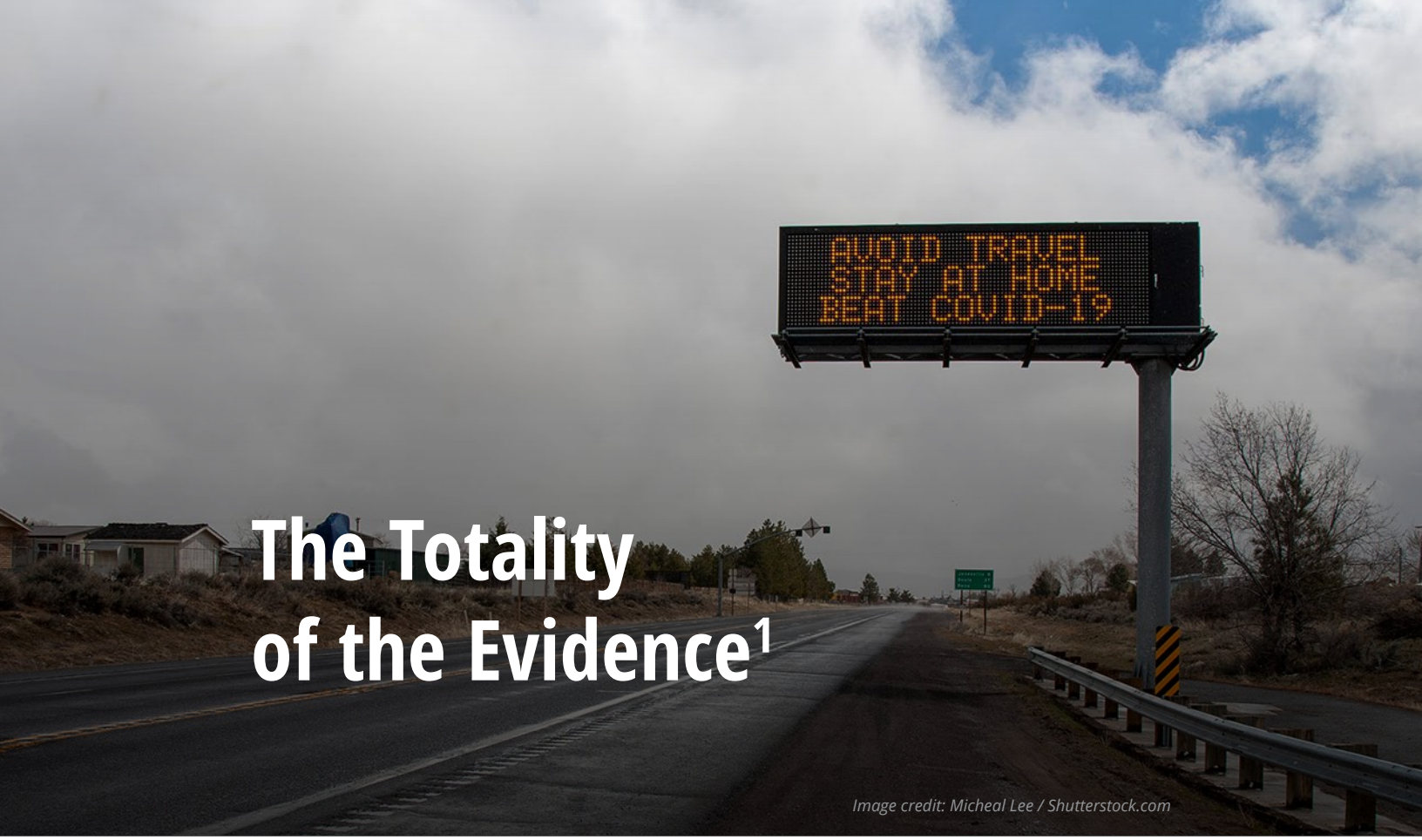


Image credit: Micheal Lee / Shutterstock.com

The Totality of the Evidence[1]

John P. A. Ioannidis, MD

Professor of Medicine, Epidemiology and Population Health, Biomedical Data Science (by courtesy), and Statistics (by courtesy), Stanford University; Co-director, Meta-Research Innovation Center, Stanford University

A person suddenly collapses on the floor — what do you do? Given the choice between acting or not acting, surely every reasonable person will say we need to act without hesitation.

But how? We first quickly collect the available data: We check whether the collapsed person has a pulse, whether he's breathing, whether he responds to verbal cues. If not, we suspect cardiac arrest and immediately start CPR — but still we try to collect both new and better data as we go along. If a blood pressure monitor becomes available and we find the patient's pressure is fine and his pulse is regular — though we didn't even feel one at first — everything changes; the situation is not as dire as we had thought. Perhaps he begins talking, though

[1] This article was first published by The Boston Review on May 26, 2020, and is republished with permission from The Boston Review and John P. A. Ioannidis.

still his breathing is labored: Our chest compressions have broken his ribs. If we don't stop CPR, the bone may pierce his lungs, causing a tension pneumothorax — a life-threatening condition that must be treated right away. Despite our best intentions, we can kill the patient if we do not change our course of action.

The main challenge in epidemiology is how to translate what we know—and what we know about what we know — into the best course of action.

The first question in emergencies, this example teaches, is not *whether* to act. It is rather *how* to act to ensure our actions do more good than harm. Populations are not individual patients, of course, but the lesson is important for thinking about the debate over the right response to the COVID-19 crisis. In his recent essay[2] in these pages, the philosopher of medicine Jonathan Fuller sheds light on this debate by describing two opposing traditions in epidemiology: one, public health epidemiology, that relies on modeling and a diversity of data, and another, clinical epidemiology, that prizes high-quality evidence from randomized studies. In an equally thoughtful response,[3] the epidemiologist Marc Lipsitch elaborates on what that opposition gets wrong.

Both Fuller and Lipsitch have eloquently expressed the simultaneously competing and coexisting worlds of models and evidence. I hope that we would all agree that we need both. Science is difficult; we cannot afford to look away from useful data, disciplines, approaches, and methods. I love science because most of the time I feel profoundly ignorant, in need of continuous education; I am grateful to all my colleagues — no matter their discipline — who help reduce my ignorance. At the same time, we should study the strengths, weaknesses, and complementarity of various approaches. The main challenge in epidemiology, in particular, is how to translate what we know — and what we know about what we know — into the best course of action.

[2] Fuller, Jonathan. 2020. "Models v. Evidence." Text. Boston Review. May 1, 2020. https://bostonreview.net/science-nature/jonathan-fuller-models-v-evidence.

[3] Lipsitch, Marc. 2020. "Good Science Is Good Science." Text. Boston Review. May 12, 2020. http://bostonreview.net/science-nature/marc-lipsitch-good-science-good-science.

As Lipsitch wisely suggests, infectious disease epidemiology and clinical epidemiology are not necessarily two opposing stereotypes; almost always they are intermingled. And as Fuller acknowledges in passing, they can coexist in the same research agenda, in the same institution, even in the same person. Most scientists cannot be slotted in one bin or the other; they struggle to make their brains work in different paradigms. Both essays classify me under the evidence-based medicine (EBM) umbrella, but while it is true that I have written papers with "evidence-based medicine" in the title, I have no official degree in EBM. When I trained in the field with the late Tom Chalmers and Joseph Lau, there were no degrees of that sort. The term "evidence-based medicine" itself wasn't coined until 1992 by clinical epidemiologists at McMaster University in Canada. Even now, almost thirty years later, in most places most scientists and physicians still have no clue what EBM really is. My official fellowship training, in fact, was in infectious diseases.

We should not look away from the real harms of the most drastic of our interventions, which also disproportionately affect the disadvantaged.

Regardless of the difficulty of classifying scientists in bins, however, science does work eventually, as researchers share knowledge and correct misconceptions. And even if we take the stereotypes of the two traditions for granted, their features ought to be reversed in one respect. In a certain sense, it is clinical epidemiology that tends to be more pragmatic, and thus more action-oriented, than its foil. Traditional epidemiology — including research programs on mechanisms of disease — can be far removed from questions of action, for good reason: Basic science has great value in itself for learning about nature and modeling its mysteries. By contrast, EBM, in particular, argues for less theory and more real-world results, less speculation and more focus on the outcomes that matter most. To put it crudely but sharply, the EBM sensibility is that theories don't count for much when they don't save lives. That process of saving lives focuses on decisions of action. Practitioners of EBM know full well that failing to act has consequences; a central lesson that it teaches is that you'd better choose wisely what you do — and what you don't.

What does all this mean in the case of COVID-19? On March 3 the World Health Organization (WHO) director-general introduced a media briefing with these

distressing words: "Globally, about 3.4 percent of reported COVID-19 cases have died. By comparison, seasonal flu generally kills far fewer than 1 percent of those infected."[4] Others spoke of a very high reproduction number,[5] of almost no asymptomatic infections,[6] and of the high likelihood that the virus would infect most of the global population. Many, including the team led by Neil Ferguson at Imperial College London, drew comparisons to the 1918 pandemic, which cost at least 50 million lives.[7] These claims had a dramatic and arguably dangerous impact on public perception. Moreover, if these claims had been true, any EBM practitioner would call for swift and thoroughgoing lockdown measures. EBM is dead clear in such situations: If the risk is 50 million deaths, shutting the world for a month or two is nothing.

But it was my infectious disease side that had questions. A virus that spreads like wildfire, killing one out of thirty and infecting almost everyone in the absence of a vaccine, should have killed far more people in China and should have spread widely worldwide, perhaps with millions of fatalities, by mid-March. Hence, as I wrote in an op-ed in Stat News,[8] I began to plead that we seek to obtain better data as quickly as possible to best inform our actions. I think lockdown was justified as an initial response, given what little we knew about this new virus, but I also think we needed better data to decide on next steps. And given what we know now, it is reasonable to consider alternatives to population-wide lockdown, even as we

[4] "WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 3 March 2020." 2020. Accessed June 24, 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---3-march-2020.

[5] Tang, Biao, Nicola Luigi Bragazzi, Qian Li, Sanyi Tang, Yanni Xiao, and Jianhong Wu. 2020. "An Updated Estimation of the Risk of Transmission of the Novel Coronavirus (2019-NCov)." *Infectious Disease Modelling* 5: 248–55. https://doi.org/10.1016/j.idm.2020.02.001.

[6] Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)." 2020. Accessed June 24, 2020. https://www.who.int/publications-detail-redirect/report-of-the-who-china-joint-mission-on-coronavirus-disease-2019-(covid-19).

[7] "Report 9 - Impact of Non-Pharmaceutical Interventions (NPIs) to Reduce COVID-19 Mortality and Healthcare Demand." 2020. Imperial College London. Accessed June 24, 2020. http://www.imperial.ac.uk/medicine/departments/school-public-health/infectious-disease-epidemiology/mrc-global-infectious-disease-analysis/covid-19/report-9-impact-of-npis-on-covid-19/.

[8] Ioannidis, John P. A. 2020. "In the Coronavirus Pandemic, We're Making Decisions without Reliable Data." *STAT* (blog). March 17, 2020. https://www.statnews.com/2020/03/17/a-fiasco-in-the-making-as-the-coronavirus-pandemic-takes-hold-we-are-making-decisions-without-reliable-data/.

continue preventive hygiene measures, exercise local infection controls, focus on protecting those most at risk, and support healthcare systems to care for patients who are sick.

(Four) and a half months after COVID-19 was officially declared a pandemic, we lament a great and acute loss of life, especially in places like Lombardy and New York. Since the outbreak was detected in Wuhan in December 2019, the global death toll is estimated to be 346,000 as of this writing. But because our interventions can harm as well as help, it is not unreasonable to put this number in context.

We now know that the death toll is not comparable to that of the 1918 pandemic. We also now know that the virus has spread widely, but for the vast majority of people it is far less lethal than we thought: It kills far fewer than 3.4 percent of those who develop symptoms. (Just two months ago), the CDC adopted an estimated death rate of 0.4 percent for those who develop symptoms and acknowledged that there are many other infected people who develop no symptoms at all.[9] These estimates will continue to improve as time goes on, but it is clear that the numbers are much lower than first feared. The exact infection fatality rate varies across populations and settings, but it appears that in most situations outside nursing homes and hospitals, it tends to be very low.[10]

We have learned that COVID-19 is yet another disease that unfortunately and disproportionately affects the elderly, the disadvantaged, and those with multiple underlying medical conditions. Besides massacring nursing homes, and having the potential to infect many vulnerable patients and providers in hospitals, it painfully emerges as yet another disease of inequality. The poor, the homeless, people in prisons, and low-wage workers in meat-processing plants and other essential jobs are among the hardest hit, while privileged people like me are videoconferencing in safety. That is a tragic disparity.

Given what we know now, it is reasonable to consider alternatives to population-wide lockdown, even as we focus on protecting those most at risk and support

[9] CDC. 2020. "Coronavirus Disease 2019 (COVID-19)." Centers for Disease Control and Prevention. February 11, 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html.

[10] Ioannidis, John. 2020. "The Infection Fatality Rate of COVID-19 Inferred from Seroprevalence Data | MedRxiv." Accessed June 24, 2020. https://www.medrxiv.org/content/10.1101/2020.05.13.20101253v2.

health care systems to care for patients who are sick.

At the same time, we should not look away from the real harms of the most drastic of our interventions, which also disproportionately affect the disadvantaged. We know that prolonged lockdown of the entire population has delayed cancer treatments[11] and has made people with serious disease like heart attacks avoid going to the hospital.[12] It is leading hospital systems to furlough and lay off personnel,[13] it is devastating mental health,[14] it is increasing domestic violence and child abuse,[15] and it has added at least 36.5 million new people to the ranks of the unemployed in the United States alone. Many of these people will lose health insurance, putting them at further risk of declining health and economic distress. Prolonged unemployment is estimated to lead to an extra 75,000 deaths of despair in the United States alone over the coming decade.[16] At a global level, disruption has increased the number of people at risk of starvation to more than a billion,[17] suspension of mass vaccination campaigns is posing a threat of resurgence of

11 Sud, Amit, Michael E. Jones, John Broggio, Chey Loveday, Bethany Torr, Alice Garrett, David L. Nicol, et al. 2020. "Collateral Damage: The Impact on Cancer Outcomes of the COVID-19 Pandemic." *MedRxiv*.

12 Krumholz, Harlan M., and M.D. 2020. "Where Have All the Heart Attacks Gone?" *The New York Times*, April 6, 2020, sec. Well. https://www.nytimes.com/2020/04/06/well/live/coronavirus-doctors-hospitals-emergency-care-heart-attack-stroke.html.

13 Leila Fadel, Meg Anderson, and Robert Benincasa. 2020. "As Hospitals Lose Revenue, More Than A Million Health Care Workers Lose Jobs." NPR.Org. Accessed June 24, 2020. https://www.npr.org/2020/05/08/852435761/as-hospitals-lose-revenue-thousands-of-health-care-workers-face-furloughs-layoff.

14 Moser, Dominik Andreas, Jennifer Glaus, Sophia Frangou, and Daniel Scott Schechter. 2020. "Years of Life Lost Due to the Psychosocial Consequences of COVID19 Mitigation Strategies Based on Swiss Data." *MedRxiv*.

15 Stanley, Maclen. 2020. "Why the Increase in Domestic Violence During COVID-19?" Psychology Today. Accessed June 24, 2020. https://www.psychologytoday.com/blog/making-sense-chaos/202005/why-the-increase-in-domestic-violence-during-covid-19.

16 "Projected Deaths of Despair During COVID-19 · Well Being Trust." 2020. *Well Being Trust* (blog). Accessed June 24, 2020. https://wellbeingtrust.org/areas-of-focus/policy-and-advocacy/reports/projected-deaths-of-despair-during-covid-19/.

17 Picheta, Rob. 2020. "Global Famines of 'Biblical Proportions' Will Be Caused by Coronavirus Pandemic, UN Warns - CNN." Accessed June 24, 2020. https://www.cnn.com/2020/04/22/africa/coronavirus-famine-un-warning-intl/index.html.

infectious diseases that kill children,[18] modeling suggests[19] an excess of 1.4 million deaths from tuberculosis by 2025,[20] and a doubling of the death toll from malaria in 2020 is expected compared with 2018.[21] I hope these modeling predictions turn out to be as wrong as several COVID-19 modeling predictions have, but they may not. All of these impacts matter, too. Policymakers must consider the harms of restrictive policies, not just their benefits.

Good science can come from public health epidemiology, from the study of infectious diseases, from evidence-based medicine, from clinical epidemiology, or from any discipline. I agree with Lipsitch that we need to respect the *totality* of the evidence — including, I would stress, evidence about the harms of prolonged lockdown — rather than rely too narrowly on the claims of any one disciplinary specialty. At the beginning, in the absence of high-quality data, we can do what seems most reasonable, following the precautionary principle and using common sense. But beyond this point, failing to correct our ignorance and adapt our actions as quickly as possible is not good science. Nor is politicizing scientific disagreement or looking away from the undeniable harms of our well-intentioned actions.

About the Author

John P. A. Ioannidis is professor of medicine, epidemiology and population health, biomedical data science (by courtesy), and statistics (by courtesy) at Stanford

[18] Organization, World Health. 2020. "Guiding Principles for Immunization Activities during the COVID-19 Pandemic: Interim Guidance, 26 March 2020." https://apps.who.int/iris/handle/10665/331590.

[19] "Report 19 - The Potential Impact of the COVID-19 Epidemic on HIV, TB and Malaria in Low- and Middle-Income Countries." 2020. Imperial College London. Accessed June 24, 2020. http://www.imperial.ac.uk/medicine/departments/school-public-health/infectious-disease-epidemiology/mrc-global-infectious-disease-analysis/covid-19/report-19-hiv-tb-malaria/.

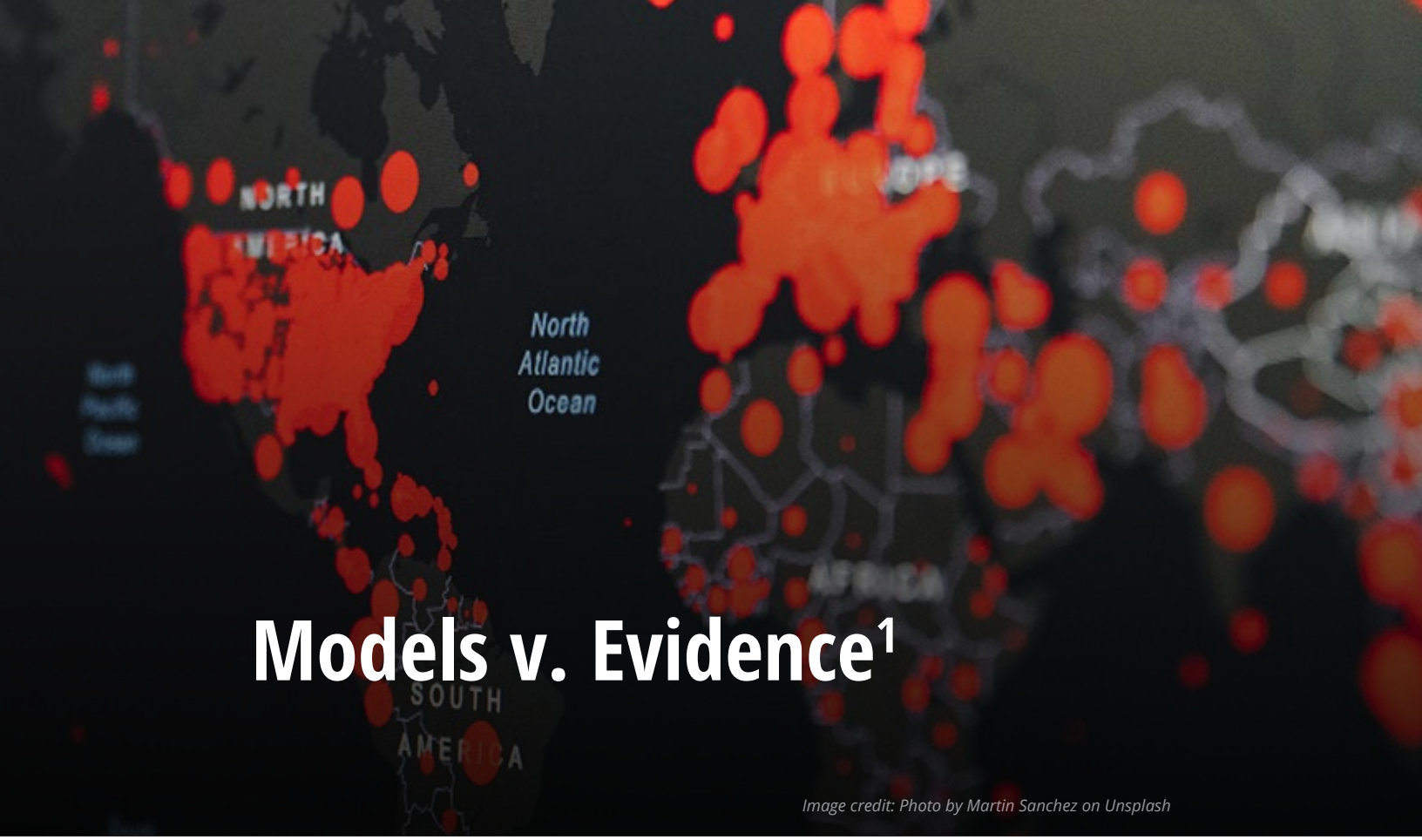
[20] Stulpin, Caitlyn. 2020. "COVID-19 Will Set Fight against TB Back at Least 5 Years." Accessed June 24, 2020. https://www.healio.com/news/infectious-disease/20200506/covid19-will-set-fight-against-tb-back-at-least-5-years.

[21] World Health Organization. 2020. "The Potential Impact of Health Service Disruptions on the Burden of Malaria." Accessed June 24, 2020. https://www.who.int/publications-detail-redirect/the-potential-impact-of-health-service-disruptions-on-the-burden-of-malaria.

University. He co-directs the Meta-Research Innovation Center at Stanford (METRICS).

Born in New York City in 1965 and raised in Athens, Greece. Valedictorian (1984) at Athens College; National Award of the Greek Mathematical Society (1984); MD (top rank of medical school class) from the National University of Athens in 1990; also received DSc in biopathology from the same institution. Trained at Harvard and Tufts (internal medicine and infectious diseases), then held positions at NIH, Johns Hopkins and Tufts. Chaired the Department of Hygiene and Epidemiology, University of Ioannina Medical School in 1999-2010 while also holding adjunct professor positions at Harvard, Tufts, and Imperial College. Senior advisor on knowledge integration at NCI/NIH (2012-6). Served as president, Society for Research Synthesis Methodology, and editorial board member of many leading journals (including PLoS Medicine, Lancet, Annals of Internal Medicine, JNCI among others) and as editor-in-chief of the European Journal of Clinical Investigation (2010-2019). Delivered ~600 invited and honorary lectures. Recipient of many awards (e.g., European Award for Excellence in Clinical Science [2007]; Medal for Distinguished Service, Teachers College, Columbia University [2015]; Chanchlani Global Health Award [2017]; Epiphany Science Courage Award [2018]; Einstein fellow [2018]). Inducted in the Association of American Physicians (2009), European Academy of Cancer Sciences (2010) American Epidemiological Society (2015), European Academy of Sciences and Arts (2015), National Academy of Medicine (2018). Honorary titles from FORTH (2014) and Ioannina (2015); honorary doctorates from Rotterdam (2015), Athens (2017), Tilburg (2019), Edinburgh (2019). Multiple honorary lectureships/visiting professorships (Caltech, Oxford, LSHTM, Yale, University of Utah, University of Connecticut, University of California-Davis Davis, University of Pennsylvania, Washington University-St. Louis, NIH, among others). The PLoS Medicine paper on "Why most published research findings are false" has been the most-accessed article in the history of Public Library of Science (3 million hits). Author of seven literary books in Greek, three of which were shortlisted for best book of the year Anagnostis awards. Brave Thinker scientist for 2010; according to Atlantic, "may be one of the most influential scientists alive." Highly Cited Researcher according to Thomson Reuters in both Clinical Medicine and in Social Sciences. Citation indices: h=199, m=8 per Google Scholar. Current citation rate: >4,500 new citations per month (among the 10

scientists worldwide who are currently the most commonly cited, perhaps also the currently most-cited physician). When contrasted against my vast ignorance, these values offer excellent proof that citation metrics can be horribly unreliable. I have no personal social media accounts — I admire people who can outpour their error-free wisdom in them, but I make a lot of errors, I need to revisit my writings multiple times before publishing, and I see no reason to make a fool of myself more frequently than is sadly unavoidable. I consider myself privileged to have learned and to continue to learn from interactions with students and young scientists (of all ages) from all over the world, and I love to be constantly reminded that I know next to nothing.



Models v. Evidence[1]

Image credit: Photo by Martin Sanchez on Unsplash

Jonathan Fuller, Ph.D., MD
Assistant Professor of history and philosophy of science, University of Pittsburgh

The lasting icon of the COVID-19 pandemic will likely be the graphic associated with "flattening the curve."[2] The image is now familiar: a skewed bell curve measuring coronavirus cases that towers above a horizontal line — the health system's capacity — only to be flattened by an invisible force representing "non-pharmaceutical interventions" such as school closures, social distancing, and full-on lockdowns.

[1] This article was first published by The Boston Review on May 05, 2020, and is republished with permission from The Boston Review and Jonathan Fuller.

[2] Black, Andrew, Dennis Liu, and Lewis Mitchell. 2020. "How to Flatten the Curve of Coronavirus, a Mathematician Explains." The Conversation. March 16, 2020. https://theconversation.com/how-to-flatten-the-curve-of-coronavirus-a-mathematician-explains-133514.

How do the coronavirus models generating these hypothetical curves square with the evidence? What roles do models and evidence play in a pandemic? Answering these questions requires reconciling two competing philosophies in the science of COVID-19.

To some extent, public health epidemiology and clinical epidemiology are distinct traditions in health care, competing philosophies of scientific knowledge.

In one camp are infectious disease epidemiologists, who work very closely with institutions of public health. They have used a multitude of models to create virtual worlds in which sim viruses wash over sim populations — sometimes unabated, sometimes held back by a virtual dam of social interventions. This deluge of simulated outcomes played a significant role in leading government actors to shut borders as well as doors to schools and businesses. But the hypothetical curves are smooth, while real-world data are rough. Some detractors have questioned whether we have good evidence for the assumptions the models rely on, and even the necessity of the dramatic steps taken to curb the pandemic. Among this camp are several clinical epidemiologists, who typically provide guidance for clinical practice — regarding, for example, the effectiveness of medical interventions — rather than public health.

The latter camp has won significant media attention in recent weeks. Bill Gates — whose foundation funds the research behind the most visible outbreak model[3] in the United States, developed by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington — worries that COVID-19 might be a "once-in-a-century pandemic."[4] A notable detractor from this view is Stanford's John Ioannidis, a clinical epidemiologist, meta-researcher, and reliable skeptic who has openly wondered whether the coronavirus pandemic might rather be a "once-in-a-century evidence fiasco."[5] He argues that better data are needed to

[3] Institute for Health Metrics and Evaluation. 2020. "IHME | COVID-19 Projections." Institute for Health Metrics and Evaluation. https://covid19.healthdata.org/united-states-of-america.

[4] Gates, Bill. 2020. "Responding to Covid-19 — A Once-in-a-Century Pandemic?" *New England Journal of Medicine*, February. https://doi.org/10.1056/nejmp2003762.

[5] Ioannidis, John. 2020. "In the Coronavirus Pandemic, We're Making Decisions without Reliable Data." STAT. March 17, 2020. https://www.statnews.com/2020/03/17/a-fiasco-in-the-making-as-the-coronavirus-

justify the drastic measures undertaken to contain the pandemic in the United States and elsewhere.

Ioannidis claims, in particular, that our data about the pandemic are unreliable, leading to exaggerated estimates of risk. He also points to a systematic review published in 2011 of the evidence regarding physical interventions that aim to reduce the spread of respiratory viruses, worrying that the available evidence is nonrandomized and prone to bias. (A systematic review specific to COVID-19 has now been published; it concurs that the quality of evidence is "low" to "very low" but nonetheless supports the use of quarantine and other public health measures.)[6] According to Ioannidis, the current steps we are taking are "non-evidence-based." [7]

This talk of "biased evidence" and "evidence-based interventions" is characteristic of the evidence-based medicine (EBM) community, a close relative of clinical epidemiology. In a series of blog posts, for example, Tom Jefferson and Carl Heneghan of the Oxford Centre for Evidence-Based Medicine similarly lament the poor-quality data and evidence guiding action in the pandemic and even suggest that lockdown is the wrong call.[8]

Models without evidence are blind, while evidence without models is inert.

In the other corner, Harvard's Marc Lipsitch, an infectious disease epidemiologist, agrees that we lack good data in many respects. Countering Ioannidis's hesitation, however, Lipsitch responds[9]: "We know enough to act; indeed, there is an imperative to act strongly and swiftly." According to this argument, we could

pandemic-takes-hold-we-are-making-decisions-without-reliable-data/.

[6] Nussbaumer-Streit, B., V. Mayr, AIulia Dobrescu, A. Chapman, E. Persad, I. Klerings, G. Wagner, U. Siebert, C. Christof, C. Zachariah, and et al. 2020. "Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review." *Cochrane Database of Systematic Reviews* (4). doi: 10.1002/14651858.CD013574.

[7] Ioannidis, John P. A. 2020. "Coronavirus disease 2019: The harms of exaggerated information and non-evidence-based measures." *European Journal of Clinical Investigation* 50 (4):e13222. doi: 10.1111/eci.13222.

[8] Jefferson, Tom, and Carl Heneghan. 2020. "COVID-19 – The Tipping Point." Last Modified April 8, 2020, accessed June 24. https://www.cebm.net/covid-19/covid-19-the-tipping-point/.

[9] Lipsitch, Marc. 2020a. "We Know Enough Now to Act Decisively against Covid-19." STAT. March 18, 2020. https://www.statnews.com/2020/03/18/we-know-enough-now-to-act-decisively-against-covid-19/.

not afford to wait for better data when the consequences of delaying action are disastrous, and did have reason enough to act decisively.

Public health epidemiologists and clinical epidemiologists have overlapping methods and expertise; they all seek to improve health by studying populations. Yet to some extent, public health epidemiology and clinical epidemiology are distinct traditions in health care, competing philosophies of scientific knowledge. Public health epidemiology, including infectious disease epidemiology, tends to embrace theory and diversity of data; it is methodologically liberal and pragmatic.[10] Clinical epidemiology, by contrast, tends to champion evidence and quality of data; it is comparatively more methodologically conservative and skeptical. (There is currently a movement[11] in public health epidemiology that is in some ways closer to the clinical epidemiology philosophy, but I will not discuss it here.)

To be clear, these comparisons are fair only writ large; they describe disciplinary orthodoxy as a whole rather than the work of any given epidemiologist. Still, it is possible to discern two distinct philosophies in epidemiology, and both have something to offer in the coronavirus crisis over models and evidence. A deeper understanding of modeling and evidence is the key not only to reconciling these divergent scientific mindsets but also to resolving the crisis.

Models

Public health epidemiology uses theory, especially theory from other health sciences like microbiology, to model infection and understand patterns and causes of disease. Many of the epidemic models that the public and public health researchers alike have been voraciously consuming —including models produced by Imperial College London[12] that informed the U.K. and U.S. coronavirus response

[10] Reiss, Julian. 2015. "A Pragmatist Theory of Evidence." *Philosophy of Science* 82 (3): 341–62. https://doi.org/10.1086/681643.

[11] Broadbent, Alex. 2015. "Causation and prediction in epidemiology: A guide to the 'Methodological Revolution.'" *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 54:72-80. doi: https://doi.org/10.1016/j.shpsc.2015.06.004.

[12] MRC Center for Global Infectious Disease Analysis. n.d. "Report 12 - The Global Impact of COVID-19 and Strategies for Mitigation and Suppression." Imperial College London. https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-12-global-impact-covid-19/.

— are SIR-type models. The theory underlying these models is old, originating in the Kermack–McKendrick theory[13] in the 1920s and '30s, and even earlier in the germ theory in the second half of the nineteenth century. The SIR framework partitions a population into at least three groups: those who are susceptible to future infection (S), those who are currently infectious (I) and those who have been removed from the infectious group through recovery or death (R). An SIR model uses a system of differential equations to model the dynamics of the outbreak, the movement of individuals among the various groups over time.

The most important question we can ask of an outbreak model during a crisis is not whether its assumptions are accurate but instead how well it predicts the future — a hard-nosed practical question rather than a theoretical one.

Other models in the SIR family[14] add additional groups to these three basic ones, such as a group for those who are infected with the virus but not yet infectious to others. Agent-based models[15] also represent infection dynamics (how the number of cases changes over time), but they do so by modeling behaviors for each member of the simulated population individually. Curve-fitting models[16] like the one used by the IHME are less theoretical; they extrapolate from previous infection curves to make predictions about the future. All these different models have been used in the COVID-19 pandemic. The diversity of approaches, along with divergent estimates for model parameters, partly explains the range of predictions we have seen.

Public health epidemiology also relies on a diversity of data — from multiple

[13] Kermack, W. O., and A. G. McKendrick. 1927. "A Contribution to the Mathematical Theory of Epidemics." *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences* 115 (772): 700–721. https://doi.org/10.1098/rspa.1927.0118.

[14] Kissler, Stephen, Christine Tedijanto, Edward Goldstein, Yonatan Grad, and Marc Lipsitch. 2020. "Projecting the Transmission Dynamics of SARS-CoV-2 through the Post-Pandemic Period." Science, May. https://doi.org/10.1126/science.abb5793.

[15] MRC Center for Global Infectious Disease Analysis. n.d. "Report 9 - Impact of Non-Pharmaceutical Interventions (NPIs) to Reduce COVID-19 Mortality and Healthcare Demand." Imperial College London. https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-9-impact-of-npis-on-covid-19/.

[16] Institute for Health Metrics and Evaluation. n.d. "IHME | COVID-19 Projections." Institute for Health Metrics and Evaluation. https://covid19.healthdata.org/united-states-of-america.

regions, using a variety of methods — to answer any one scientific question. In the coronavirus pandemic, in particular, research groups have used estimates of multiple key parameters of the outbreak (infection rate, average duration of illness) derived from multiple settings (China, Italy) and produced by various kinds of studies (population-based, laboratory-based, clinically based) to make projections. Public health epidemiology is liberal in the sense of relying on multiple tools, including modeling techniques (the Imperial College team has used several models[17]), and also in the sense of simulating various possibilities by tweaking a model's assumptions. Finally, its philosophy is pragmatic. It embraces theory, diversity of data, and modeling as a means to reaching a satisfactory decision, often in circumstances where the evidence is far from definitive but time or practical constraints get in the way of acquiring better evidence.

A formative scientific moment for the public health epidemiology tradition was the epidemiological research on smoking and lung cancer[18] in the 1950s and 60s. Although lung cancer is not an infectious disease and SIR modeling played no starring role in this research, it featured a similar scientific approach and philosophical outlook. The public health epidemiology philosophy is especially necessary early on in an outbreak of a novel pathogen, when untested assumptions greatly outnumber data, yet predictions and decisions must still be made.

Neil Ferguson, one of the leading epidemiologists behind the Imperial College models, describes epidemic modeling as "building simplified representations of reality."[19] The characterization is apt because SIR-type models have variables and equations meant to represent real features of the populations modeled. (Other types of scientific tools, such as black box neural nets used in machine learning, work differently: they do not attempt to mirror the world but simply to predict its behavior.) We could therefore ask how well an SIR-type model mirrors reality. However, the primary use of the models, especially early on in an epidemic, is to

[17] Adam, David. 2020. "Special Report: The Simulations Driving the World's Response to COVID-19." *Nature*, April. https://doi.org/10.1038/d41586-020-01003-6.

[18] Instant HPS. 2020. "Smoking and Lung Cancer: From Association to Causation." YouTube Video. *YouTube*. https://www.youtube.com/watch?v=HHCzDbev7tw.

[19] Adam, David. 2020a. "Special Report: The Simulations Driving the World's Response to COVID-19." *Nature*, April. https://doi.org/10.1038/d41586-020-01003-6.

predict the future of the outbreak, rather than to help us explain or understand it. As a result, the most important question we can ask of an outbreak model during a crisis is not whether its assumptions are accurate but instead how well it predicts the future — a hard-nosed practical question rather than a theoretical one.

Public health epidemiology is pragmatic. It embraces theory, diversity of data, and modeling as a means of recommending policy.

Of course, predictive power is not totally unrelated to a model's representational accuracy. One way to improve the predictive prowess of model is to go out and collect data that can confirm or deny the accuracy of its assumptions. But that's not the only way. By running many simulations of the same model under different assumptions (so-called sensitivity analysis), a modeler can determine how sensitive the model's predictions are to changes in its assumptions. By learning from multiple different models, a scientist can also triangulate, so to speak, on a more robust prediction that is less susceptible to the faults of any one model. Both strategies were used in determining U.K. coronavirus policy.

Finally, often a single, more accurate prediction based on high-quality evidence is less useful than a range of modeling predictions that capture best-case and worst-case scenarios (such as the range of death counts the White House Coronavirus Task Force[20] presented at the end of March). It might be prudent to plan for the worst case and not only the most likely possibility. A pragmatic philosophy generally serves public health decision makers well.

However, when certain predictions based on plausible model assumptions would lead decision makers to radically different policy recommendations, the assumptions should be investigated with further evidence. A team at Oxford University[21], for example, performed epidemic modeling specifically to illustrate

[20] Chow, Denise. 2020. "The White House Unveiled Its Coronavirus Model. Here's What We Know." NBC News. March 31, 2020. https://www.nbcnews.com/science/science-news/what-we-know-about-coronavirus-model-white-house-unveiled-n1173601.

[21] Lourenco, Jose, Robert Paton, Mahan Ghafari, Moritz Kraemer, Craig Thompson, Peter Simmonds, Paul Klenerman, and Sunetra Gupta. 2020. "Fundamental Principles of Epidemic Spread Highlight the Immediate Need for Large-Scale Serological Surveys to Assess the Stage of the SARS-CoV-2 Epidemic." *MedRxiv*, March. https://doi.org/10.1101/2020.03.24.20042291.

that worrying coronavirus projections depend crucially on estimates of the number of individuals previously infected and now immune to the virus. It is this kind of uncertainty that serves as fodder for the evidence thumpers.

Evidence

Clinical epidemiologists are playing their own part in the pandemic: They are designing clinical trials of COVID-19 treatments, such as the World Health Organization–organized multi-country "Solidarity Trial."[22] In keeping with the high standards of evidence in the EBM movement, these trials are randomized: Individuals are randomly allocated to receive one treatment or another (or a different combination of treatments). Although opinions on the exact virtues of randomization vary slightly, the most popular idea is that randomization reduces systematic bias. In a clinical trial, randomization eliminates selection bias, resulting in trial groups that are more representative or comparable[23] in terms of causally relevant background features. Randomized studies are preferred because they can generate evidence that is less biased and more accurate.

The clinical epidemiology tradition cautions that theory can sometimes mislead us — for instance, by smuggling in unproven assumptions that have not been empirically established in human populations.

The concept of evidence is central to clinical epidemiology and EBM alike. Clinical epidemiology research produces evidence, while EBM experts critically appraise it. Good evidence, this tradition says, consists mainly in the results of clinical epidemiology studies. The tradition is generally suspicious of theory, including reasoning based on pathophysiology and models of disease. It often cautions that theory can sometimes mislead us — for instance, by smuggling in unproven assumptions that have not been empirically established in human populations. In the coronavirus case, models assume — based on experience with other

[22] World Health Organization. n.d. "'Solidarity' Clinical Trial for COVID-19 Treatments." www.who.int. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-clinical-trial-for-covid-19-treatments.

[23] Fuller, Jonathan. 2018. "The Confounding Question of Confounding Causes in Randomized Trials." *The British Journal for the Philosophy of Science* 70 (3): 901–26. https://doi.org/10.1093/bjps/axx015.

pathogens, but not concrete evidence with the new coronavirus — that individuals who recover from infection will develop immunity against reinfection, at least in the short term.

A central concern for this philosophy is not the diversity but the quality of data. A founding principle of EBM[24] is that the best medical decisions are those that are based on the best available evidence, and evidence is better if it consists of higher-quality data. EBM provides guidance on which evidence is best, but clinical epidemiological methods such as meta-analysis do not allow one to amalgamate diverse kinds of evidence. The tradition is also conservative in basing conclusions only on well-established empirical results rather than speculative modeling, preferring "gold standard" randomized studies to hypothetical simulations. Finally, this tradition is skeptical, challenging assumptions, authority and dogma, always in search of study design flaws and quick to point out the limitations of research.

A formative moment for the clinical epidemiology tradition was the British Medical Research Council's 1948 trial[25] of streptomycin for tuberculosis, widely considered to be one of the first modern randomized clinical trials. This philosophy can be especially helpful as an outbreak of a novel pathogen evolves, as better evidence becomes available to scrutinize previous assumptions and settle unanswered questions. Clinical epidemiology has the expertise to contribute much of this evidence.

In advocating for evidence-based public health measures,[26] Ioannidis suggests subjecting interventions like social distancing measures to randomized trials. His suggestion may not be feasible in the United States, given multiple levels of governance over social distancing policies, among other logistical difficulties. But the suggestion that we should be studying the effectiveness of our public health interventions is as important as it is obvious, and clinical epidemiology is well

[24] Djulbegovic, Benjamin, and Gordon H Guyatt. 2017. "Progress in Evidence-Based Medicine: A Quarter Century On." *The Lancet* 390 (10092): 415–23. https://doi.org/10.1016/s0140-6736(16)31592-6.

[25] Medical Research Council. 2010. "Streptomycin Treatment of Pulmonary Tuberculosis." The James Lind Library. May 26, 2010. https://www.jameslindlibrary.org/medical-research-council-1948b/.

[26] Ioannidis, John P. A. 2020. "Coronavirus Disease 2019: The Harms of Exaggerated Information and Non-evidence-based Measures." *European Journal of Clinical Investigation* 50 (4). https://doi.org/10.1111/eci.13222.

placed to contribute to this endeavor. While public health epidemiology is adept at studying the distributions and determinants of disease, clinical epidemiology is at home in studying the effectiveness of healthcare interventions. (I do not mean to suggest that public health epidemiology lacks the resources to study its own interventions. Consider, for example, this clever impact study[27] by Imperial College London.)

Measuring the effects of public health measures is far from trivial. Social distancing is not an intervention: It is a mixed bag of individual behaviors, some voluntary and some involuntary. These behaviors are represented in outbreak models by simulating reduced social interactions. The models sometimes suppose that certain specific interventions, such as school or business closures, will produce particular patterns of social mixing. But the *effects* of specific interventions on patterns of social mixing is not the target of a classic SIR model. The modeler *inputs* patterns of social interaction; the model doesn't spit them out. (However, disease behavior models[28] *do* model social dynamics together with viral dynamics.) Rigorous research is needed to separate out the effects of individual interventions that have often been implemented simultaneously and are difficult to disentangle from independent behavior changes. Moreover, our interventions might have independent effects (on health, on the economy), and an outbreak model isn't broad enough[29] in scope to predict these effects.

Institutionalized skepticism is important in science and policymaking. Too much of it is paralyzing, but it can provide a check on the pragmatic ethos of public health epidemiology.

Ioannidis also suggests a solution to the problem of inaccurate pandemic statistics:

[27] MRC Center for Global Infectious Disease Analysis. 2020b. "Report 13 - Estimating the Number of Infections and the Impact of Non-Pharmaceutical Interventions on COVID-19 in 11 European Countries." Imperial College London. March 30, 2020. https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-13-europe-npi-impact/.

[28] Tyson, Rebecca C., Stephanie D. Hamilton, Aboubakr S. Lo, Bert O. Baumgaertner, and Stephen M. Krone. 2020. "The Timing and Nature of Behavioural Responses Affect the Course of an Epidemic." *Bulletin of Mathematical Biology* 82 (1). https://doi.org/10.1007/s11538-019-00684-z.

[29] Fuller, Jonathan. 2020a. "Why Coronavirus Death Rates Can't Be Summed up in One Simple Number." The Conversation. April 10, 2020. https://theconversation.com/why-coronavirus-death-rates-cant-be-summed-up-in-one-simple-number-135758.

testing representative population samples, rather than relying on samples subject to sampling bias. In order to estimate the number of infected people and the growth of the pandemic over time, we can repeatedly sample from key demographics and perform diagnostic testing. Representative sampling and antibody assays can also help estimate the number of previously infected individuals who may be immune to reinfection. This information can help to rule out the Oxford scenario[30] in which the susceptible population is much, much smaller than we think. It can also help in estimating the infection fatality ratio, the proportion of COVID-19 patients who die from their infection. Ioannidis argues that the infection fatality ratio has been greatly overestimated in certain contexts due to biased testing. Antibody testing has already begun in the United States and other countries, including a (not yet peer-reviewed) study[31] by Ioannidis and colleagues estimating much higher prevalence of past COVID-19 infections in Santa Clara County than the official count. Ironically, the study was immediately criticized by scientists partly for its Facebook recruitment strategy on the grounds it may have resulted in a biased sample.

The key to proper representative sampling is clinical epidemiology's favorite motto: Randomize it! Random sampling[32] can overcome the sampling bias that has plagued modeling projections alongside the coronavirus. The clinical epidemiology tradition, transfixed with unbiased evidence, provides a ready solution to an urgent problem facing public health epidemiology.

The final gift that clinical epidemiology offers is its skeptical disposition. Institutionalized skepticism is important in science and policymaking. Too much of it is paralyzing, especially in contexts of information poverty that call for

[30] Lourenco, Jose, Robert Paton, Mahan Ghafari, Moritz Kraemer, Craig Thompson, Peter Simmonds, Paul Klenerman, and Sunetra Gupta. 2020a. "Fundamental Principles of Epidemic Spread Highlight the Immediate Need for Large-Scale Serological Surveys to Assess the Stage of the SARS-CoV-2 Epidemic." *MedRxiv*, March. https://doi.org/10.1101/2020.03.24.20042291.

[31] Bendavid, Eran, Bianca Mulaney, Neeraj Sood, Soleil Shah, Emilia Ling, Rebecca Bromley-Dulfano, Cara Lai, et al. 2020. "COVID-19 Antibody Seroprevalence in Santa Clara County, California," April. https://doi.org/10.1101/2020.04.14.20062463.

[32] Rockmore, Daniel N., and Michael Herron. 2020. "Want to Know How Many People Have the Coronavirus? Test Randomly." The Conversation. April 13, 2020. https://theconversation.com/want-to-know-how-many-people-have-the-coronavirus-test-randomly-135784.

pragmatism — like at the outset of a pandemic involving a novel pathogen when we don't have gold-standard evidence to guide us, but inaction carries the risk of dire consequences. But clinical epidemiology's skeptical orientation can provide a check on the pragmatic ethos of public health epidemiology, preventing action from outrunning evidence, or at least helping evidence to catch up.

At the same time, a myopic focus on evidence alone would do a disservice to epidemiology. Were we to conduct randomized trials of public health interventions, the evidence generated would be inherently local — specific to the context in which the trials are run — because the effects of public health interventions (really, all interventions) depend on what other causal factors are in play. We can't simply extrapolate[33] from one context to another. Similarly, we should not blindly extrapolate infection statistics from one location to another; all these parameters — the reproductive number, the attack rate, the infection fatality ratio — are context-sensitive[34]. None of these statistics is an intrinsic property of the virus or our interventions; they emerge from the interaction among intervention, pathogen, population and place.

It is theory, along with a reliance on a diverse range of data, that make coronavirus evidence collected in one place relevant to another. Evidence for the effects of interventions on social interactions must be combined with outbreak models representing those interactions. Evidence for age-stratified infection fatality ratios must be combined with local data about the age structure of a population to be of any use in predicting fatalities in that population. In an outbreak, models without evidence are blind, while evidence without models is inert.

Where does this clash of sensibilities leave us? In my own work, I have modeled prediction in evidence-based[35] medicine as a chain of inferences. Each individual inference is a link forged from assumptions in need of evidence; the chain is

[33] Fuller, Jonathan. 2019. "The Myth and Fallacy of Simple Extrapolation in Medicine." *Synthese*, May. https://doi.org/10.1007/s11229-019-02255-0.

[34] Fuller, Jonathan. 2020a. "Why Coronavirus Death Rates Can't Be Summed up in One Simple Number." The Conversation. April 10, 2020. https://theconversation.com/why-coronavirus-death-rates-cant-be-summed-up-in-one-simple-number-135758.

[35] Fuller, Jonathan, and Luis J. Flores. 2015. "The Risk GP Model: The Standard Model of Prediction in Medicine." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 54 (December): 49–61. https://doi.org/10.1016/j.shpsc.2015.06.006.

broken if any assumption breaks down. In their book, *Evidence-Based Policy* (2012), the philosopher of science Nancy Cartwright and the economist Jeremy Hardie represent predictions about the effectiveness of a policy using a pyramid. The top level, the hypothesis that the policy will work in some local context, rests on several assumptions, which rest on further assumptions, and so on. Without evidence for the assumptions, the entire structure falls.

We should welcome both of epidemiology's competing philosophies. Cooperation in society should be matched by cooperation across disciplinary divides.

Either picture is a good metaphor for the relationship between evidence and models. Evidence is needed to support modeling assumptions to generate predictions that are more precise and accurate. Evidence is also needed to rule out alternative assumptions, and thus alternative predictions. Models represent a multiverse of hypothetical futures. Evidence helps us predict which future will materialize directly by filling in its contours, and indirectly by scratching out other hypothetical worlds.

The need for evidence and modeling will not dissolve when the dust settles in our future world. In evaluating the choices we made and the effectiveness of our policies, we will need to predict what would have happened otherwise. Such a judgment involves comparing worlds: the actual world that materialized and some hypothetical world that did not. How many COVID-19 deaths did our social distancing measures prevent? We can estimate the number of COVID-19 deaths in our actual socially distanced world by counting, but to predict the number of COVID-19 deaths in an unchosen world without social distancing we will need to dust off our models and evidence.

Just as we should embrace both models and evidence, we should welcome both of epidemiology's competing philosophies. This may sound like a boring conclusion, but in the coronavirus pandemic there is no glory, and there are no winners. Cooperation in society should be matched by cooperation across disciplinary divides. The normal process of scientific scrutiny and peer review has given way to a fast track from research offices to media headlines and policy panels. Yet the need for criticism from diverse minds remains.

I mentioned that the discovery that smoking causes lung cancer was a discipline-

defining achievement for public health epidemiology, while the British Medical Research Council's streptomycin trial was a formative episode in the history of clinical epidemiology. The epidemiologist Austin Bradford Hill played a role in both scientific achievements. He promoted the clinical trial[36] in medicine and also provided nine criteria[37] ("Hill's Viewpoints") still used in public health epidemiology for making causal inferences from a diversity of data.

Like Hill, epidemiology should be of two minds. It must combine theory with evidence and make use of diverse data while demanding data of increasingly higher quality. It must be liberal in its reasoning but conservative in its conclusions, pragmatic in its decision making while remaining skeptical of its own science. It must be split-brained, acting with one hand while collecting more information with the other. Only by borrowing from both ways of thinking will we have the right mind for a pandemic.

About the Author

Jonathan Fuller is assistant professor of history and philosophy of science at the University of Pittsburgh. He earned a Ph.D. in philosophy of medicine and an MD from the University of Toronto. His main research focus is the philosophy of medicine. His research currently has two strands: disease and biomedicine, and epidemiology and evidence-based medicine. He has recently studied the metaphysics and classification of contemporary diseases as well as modelling of diseases and medical interventions. He has also worked on causal inference, external validity, meta-research and the relationship between population data and individuals in clinical research and epidemiology.

Fuller is currently working on the problem of what general attitude we should take toward the results of biomedical and clinical research, as well as the historical-philosophical question of what makes scientific medicine today

[36] Hill, Austin Bradford. 1952. "The Clinical Trial." The James Lind Library. New England Journal of Medicine. July 24, 1952. https://www.jameslindlibrary.org/hill-ab-1952/.

[37] Bradford, Sir, and Hill Cbe. 1965. "Section of Occupational Medicine — The Environment and Disease: Association or Causation?" https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1898525/pdf/procrsmed00196-0010.pdf.

fundamentally the same compared to scientific medicine a hundred years ago — and what makes it fundamentally different. His other interests include the philosophy of psychiatry: He is curious about what psychiatry and neurology can teach us about mind and self. He also has training in medicine and medical education and am interested in how philosophy can enhance medical education and practice.

Coronavirus: Thoughts on End Times

Image credit: Chansom Pantip / Shutterstock.com

Graham E. Fuller
Former Vice Chair, CIA National Intelligence Council; Former CIA Kabul Station Chief

These are not, of course, strictly speaking, end times. But for the first time in a long time, there is a whiff of the apocalyptic in the air. The Black Swan has come out of the blue. Events utterly unanticipated in any practical near-term sense now suddenly overwhelm the daily news. Certainly, some scientists and a few visionaries warned in the past of the distinct likelihood of such a pandemic, but it was always theoretical. Now it isn't.

Statesmen and politicians now face some harsh decisions in managing this crisis. But there is one issue that stands out as particularly sensitive and emotional, and hence little addressed. In bluntest terms, how do we balance between the costs of the possible loss of several million lives to the coronavirus, and the costs of a response that is destroying the political, social and economic structures of the world?

As in most issues, it is our particular *perceptions* of reality that dominate our actions. The coronavirus is charged with emotive power. It is new, has no known defenses or cure at present, has its own signature of attack, comes (for westerners) from distant Asia, is disturbingly linked to the image of bats as a likely origin — all this enhances our fear of the unknown. Modern media provides just the kind of 24/7 echo box to amplify and even wallow in the fear and uncertainty. And on top of that we see a broad range of special domestic and foreign agendas joining in to try to shape our perceptions and responses.

Perhaps the hardest part of all is to try to speak "objectively" about death. The statistics show the deaths worldwide from the virus, at least so far, fall well short of the near millions of deaths unleashed by two U.S. wars in Afghanistan and Iraq that still find no end. Or the savage and tragic Saudi-conducted war (supported by the U.S.) against impoverished Yemen with 10,000 dead. And the ongoing deaths in the civil war in the Congo — probably exceeding five million — don't even register on anyone's screen. But those deaths are mostly "over there" and not here.

But of course, statistical comparisons like this quite miss the mark. We all know vehicle deaths vastly exceed deaths by terrorism — but highways are a routinely accepted, known risk of modern life. Terrorism is not a known risk and, hence, occupies vastly more attention than actual numbers involved. In short, the impact of deaths tends not to be proportionate to the numbers but to the particular psychological impact.

The dawning reality during this pandemic portrays how perhaps the most truly devastating impacts of the coronavirus stem from the variety of state actions taken in response to it — actions that our politicians and leaders hope will help stop the virus. Among the actions and guidelines that have been taken and presented are the closing of borders, the shuttering of shops and closing of private businesses, the cancellation or postponement of most forms of public entertainment, and social distancing and "shelter in home" self-quarantine — each with consequential impacts ranging from job loss to overall economic depression.

It may be some time before it becomes clear just how much the sweeping measures to halt the spread of the virus may, in the end, be worse than the disease. But how much worse? In an age when pandemics are likely to emerge again, how much and

how often can leaders really shatter public life to meet the disease? And how will shattered economic and social orders ever restore themselves?

In demographic terms — and we must think in those terms when the welfare of huge societies is at stake — we need ask: What are the trade-offs between higher death rates, especially among elderly and infirm populations on the one hand — and the paralysis and near destruction of the entire social and economic order we live in? (I write this as a member myself of the statistically most highly threatened social cohort at risk of acquiring — and dying from — the disease.) But it is irresponsible to shy away from acknowledging the fact that some kinds of trade-offs do exist. In wartime and massive natural disasters it is called triage — saving those who can be most practically saved. How much should we move heaven and earth to save everybody at the cost of greater social and economic destruction? There is no concrete answer to such a delicate and painful question. But it must be asked.

And then come some of the hard, political questions of system of governance. The coronavirus experience, like nothing previous, dramatizes the extremely delicate and complex character of our world. What kind of governance will the world adopt to manage future such nonmilitary global crises? China's apparent quick recovery — after an initial failure to deal with the crisis at its outbreak — strongly suggests that its centralized authoritarian order may be one of the most effective ways to manage large and complex societies.

China was, of course, initially slow off the mark in recognizing the threat — a failure we have seen widely across many western nations. Some observers optimistically point to democratic South Korea's (or Taiwan's or Japan's) fairly successful response at handling the virus spread as demonstration that a democratic response to such crisis can succeed. But it is important to remember that all these Asian nations also operate within an internalized and quite self-disciplined framework of Confucian origin, producing a kind of tractable and deferential social order not remotely comparable to the impassioned individualism of the U.S., which responds in part by denial — or by buying more guns. Debate over the relative merits of political systems will grow, rather than recede, with time. And China and America are not the only potential models.

It is already growing clearer that when — and if — life eventually returns to "normal," it cannot truly ever get back to what it was. Consider the deep failings of our American social order — the impoverished "gig" worker, the huge rich-poor gap, the lack of fundamental social safety nets, the morbid fear of "government" doing anything versus privatization of everything, the reckless continuation of mining and consuming of fossil fuels; does the coronavirus hopefully suggest we cannot now go back to that? Will Bernie Sanders' years of drumbeat about the need for a national health care plan now ring truer, even to those who will not vote for him? The coronavirus has served to further rip off the veil to reveal the deep fissures in American society and governance. Mere acknowledgment of that reality at long last could be a big plus for the country, a valuable point of transition to painful new thinking about how the country should, and should not, be run.

Will the trillions of dollars that the combined damage this new virus will inflict on the nation perhaps pry open the door to a national examination of whether in this kind of world the U.S. needs a military budget exceeding the combined budgets of the next seven biggest nations of the world? Where should this money be most wisely spent? Are pandemics and climate crises not the true threat to our nation and the shared future world?

Will our conviction in America as "the exceptional nation" — exempt from the rules of international law and conduct — and our pervasive sense of superiority in all things perhaps be just a bit humbled as the country sinks ever deeper by so many measurements against most industrialized nations of the world? Will our extreme capitalism and worshipful laissez-faire economic policies perhaps now take a hit of realism from the rest of the world? Is the Gross National Product (GNP) triumphalism the best gauge of how well off our individual citizens' lives are — or do many European states have a better sense of what represents a healthy society?

Will this new American brush with common global cause perhaps enable us to ease off from our obsessive search for geopolitical adversaries abroad? Science fiction has long loved the trope that only an invasion of Martians would be able to unite all the people of our Earth to common cause. Perhaps the coronavirus may help shift our attention now to what is truly a global human crisis — in which we are all equally winners or losers. When things "go back to normal" will any new and wiser insights have percolated into our national mindset about better ways to run the world?

It might be useful to think of the coronavirus as something akin to a "shakedown" exercise. A gauge of our fitness for what is coming. A kind of rehearsal for another global crisis — another virus attack or more "apocalyptic" climate change disasters.

I have long believed — and here many readers will vehemently depart company from me — that the collective diseases of our society and political order mentioned above may require just such a major crisis in the country, a kind of "hitting the wall" that will finally register upon the national psyche how much deep changes are required. Is perhaps the coronavirus the beginning of that painful process of "hitting the wall" that can spark major introspection into our national priorities?

No, these are not end times. But a glimpse behind the veil? A small foretaste? A premonition of the need to start changing things? It would be too bad if all we aspire to is only to return to business as usual once this particular virus has been beaten back. If ever it is.

About the Author

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Europe and the COVID-19 Pandemic: A Snapshot and Possible Scenarios

Image credit: Xavier Lejeune Photo / Shutterstock.com

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The world, and particularly Europe, is hit by the COVID-19 pandemic. In contrast to previous health crises, this one hits Europe disproportionately – until now, at least. Although EU inhabitants constitute only 5.9% of world population, it counts 15.3% of confirmed cases and 29.6% of world deaths.[1]

This is why probably nowhere else is the health crises so intensively reported

[1] Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. 2020. "Coronavirus COVID-19 (2019-NCoV)." 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd-40299423467b48e9ecf6.

on and discussed as in Europe. Although scientists had been warned of a major pandemic to hit the world sooner or later, people and governments have been taken largely by surprise. Furthermore, the crisis hits at a time where society and economy has already been hit by and is struggling with other crises – short term (as the trade war between the U.S. and China) and longer term (as growing inequality, state fragility, climate change, endangered biodiversity).

Different from previous epidemics – pest, cholera and the Spanish Flu of 1918-20 that claimed millions of victims – mortality of the COVID-19 pandemic has yet to record such numbers, although the future count remains unpredictable until a vaccine is discovered. The effects of the pandemic hits vulnerable groups – the poor as well as refugees and migrants disproportionally – in developing and industrial countries. No previous epidemic has resulted in such comprehensive and such pervasive state measures.

In addition to the vast reporting and public attention that crowded out deep coverage of other global and regional issues, there is a profound sense of uncertainty – not only of the general public, but also business and policymakers.[2] The current pandemic also results in intensive discussions among scientists, policy-makers, academics and intellectuals that go far beyond health matters while also questioning conventional development models and ways of life.

Although it is not clear how long and deep the pandemic will evolve and how it will be geographically distributed, one fact seems to be clear: The world in Europe and beyond will not return to the same state as it was before. It is impossible to draw any firm conclusions and predictions as the pandemic evolves. This article discusses possible developments that may emerge.

A major crisis – an end of an epoch?

Numerous commentators go as far as pronouncing the end of an epoch, particularly

[2] From 2008-11 according to one index uncertainty increased by 200%. Marin estimates a 300% increase following COVID-19: Marin, Dalia. 2020. "How COVID-19 Is Transforming Manufacturing | by Dalia Marin." Project Syndicate. April 3, 2020. https://www.project-syndicate.org/commentary/covid19-and-robots-drive-manufacturing-reshoring-by-dalia-marin-2020-04?barrier=accesspaylog.

the end of neoliberalism.[3] This mode or ideology, dominant thinking since the 1990s, in developing and industrialised countries, stipulated the superiority of markets over state actions and of unregulated global integration.

In truth, neoliberalism has been widely and increasingly under fire for some time. The substantive benefits of market liberalisation and economic globalisation are undisputed, in particular in developing countries, where many have been lifted out of poverty. But the downsides of unbridled capitalist development have come into the open consciousness. Unchecked market development has often led to market concentration and extra profits, undermining the principle of meritocracy. Inequality has risen starkly. Unrestrained global integration has risen the vulnerability of third world countries to national crises. Climate change and reductions in biodiversity are among the most prominent downsides of a development path led by neoliberalism. Privacy concerns have grown alongside technical innovations involving artificial intelligence and big data. On a general level, there is an awareness that the vast wealth created is not translated to a corresponding quality of life for all.

In fact, the "hyper-globalisation" phase has arguably already surpassed its summit. Trade figures indicate that the openness of the world economy peaked in 2011. From 1990 to 2008 the rapid expansion of growth was driven by growing global supply chains, accounting for 60-70% of overall growth. But the rise of protectionist policies put an increasing strain on such expansion. After the present COVID-19 supply shock, experts expect that the technology-driven process of relocation of manufacturing from Asia and elsewhere may accelerate.[4] Many supply chains will be closer to home. Emphasis on resilience will supersede price. True economic transport prices (including the CO2 effects) will strengthen the trend for shorter supply chains.

[3] Schmitz, Gregor. 2020. "The Crisis of a Lifetime." ECFR. May 12, 2020. https://www.ecfr.eu/article/commentary_the_crisis_of_a_lifetime.; Schwab, Klaus. 2020. "Now Is the Time for a 'Great Reset.'" World Economic Forum. March 6, 2020. https://www.weforum.org/agenda/2020/06/now-is-the-time-for-a-great-reset/.; Stiglitz, Joseph E. 2019. "The Economy We Need | by Joseph E. Stiglitz." Project Syndicate. May 3, 2019. https://www.project-syndicate.org/onpoint/the-economy-we-need-by-joseph-e-stiglitz-2019-05?barrier=access-paylog.

[4] Marin, Dalia. 2020. "How COVID-19 Is Transforming Manufacturing | by Dalia Marin." Project Syndicate. April 3, 2020. https://www.project-syndicate.org/commentary/covid19-and-robots-drive-manufacturing-reshoring-by-dalia-marin-2020-04?barrier=accesspaylog.

On the background of the multitude of crises, arguably the world was only waiting for the present pandemic to strengthen the challenge to the present "hyper-globalisation." But an epoch does not end by one event, but by a number of interconnected occurrences. Developments will depend on how deep and long the crisis will become, and how successful the responses will be. It will also depend on how successful the forces of interest groups seeking to maintain the status quo will be. In any case, the future looks more open presently than it has been for a long time. The world is in a period of accelerating change, the leading edge of which is the ever-growing list of developments that have gone from impossible to inevitable.[5]

But it is not certain or even likely that this will be a turning point. In the first place, the pandemic is throwing the dominant characteristics of each country's politics into sharper relief, "rather than being a watershed ... hyper-globalization will remain on the defensive as nation-states reclaim policy space."[6]

In any case, the pandemic is a window of opportunity for progressives. The future seems to be wide open for substantial change, at least in Europe – the combination of a more socially just society with less inequality and poverty, firm democracy and a carbon neutral future. While similar hopes for fundamental corrections of the unregulated economic system after the financial crisis had been largely unfulfilled – the financial sector has been left underregulated – there is an expectation that a lesson has been learned that larger change is needed, both for the international system and the EU.

[5] El-Erian, Mohamed A. 2020. "Adaptation to a Frantic World| by Mohamed A. El-Erian." Project Syndicate. February 18, 2020. https://www.project-syndicate.org/commentary/companies-and-governments-adapt-to-four-secular-changes-by-mohamed-a-el-erian-2020-02/german?barrier=accesspaylog.

[6] Rodrik, Dani. 2020. "Will COVID-19 Remake the World? | by Dani Rodrik." Project Syndicate. April 6, 2020. https://www.project-syndicate.org/commentary/will-covid19-remake-the-world-by-dani-rodrik-2020-04?barrier=accesspaylog.; Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. 2020. "Operations Dashboard for ArcGIS." Arcgis.Com. 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6.

Widely different impacts and reactions – Germany as a model?

The pandemic hits some countries in Europe much harder than others. Among the underlying factors are certainly the timing of when the virus hit. Those affected later have had more time to prepare and learn from those hit first. Secondly, those more internationally integrated were more vulnerable than those less globally engaged. But also, underlying factors such as the quality of health services and wider governance, are important.

In particular, the relative success by Germany is discussed. This biggest EU member, strongly integrated in the centre of Europe and a recognized world player, had – so far – less COVID-19 infections and less deaths than all the other large countries and in relation to its size with most other European countries.[7]

Although Germany has also gone through the privatisation and market-driven health sector reform (with too few and too poorly paid staff), this has not been as extreme as many others. The country's fiscal policy has been very conservative, with low and falling debt levels. This allowed the government a greater fiscal response to cushion the economy against the shock of a lockdown with reduced economic activities. Important are short-time benefits for workers and bail outs for companies. Other positive factors include a higher level of public trust; a less poisoned public debate with less prominent populist parties; transparent and open discussion; and a strong link between policy-makers and research, the federal system of government and the still-strong corporate system of public-private-labour interaction. To be certain, these factors are in no way unique to Germany. Arguably, some of these can be characterised as social-democratic, many of which are more pronounced in Scandinavia.

In any case, the social market economy alternative to the Anglo-American "free enterprise" model has so far performed much better on the pandemic. However, it remains to be seen to which degree the vast-boost programme will lead to a quick recovery.

[7] Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. 2020. "Operations Dashboard for ArcGIS." Arcgis.Com. 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6.

The pandemic highlights the importance of governance quality

Governance concerns the exercise of authority and control in relation to the management of its resources. The decentralised and consensus-seeking way practised, for example, in Germany is more complex and takes more time. However, combined with an open and transparent way of communication, it results in higher acceptance, higher trust and less-costly mistakes. Federal governments where decisions are made by those close to the ground are more appropriate for health crises that differ by locality. Top-centred systems with a strong president or prime minister, such as the U.S., UK, or France, have not done very well on this crisis so far.

One topic highly discussed is the – presumed by many – higher ability of authoritarian systems (such as China) to deal with such crises as this one. But while it was apparently able to quickly contain the epidemic, this was only after weeks of suppressing news about it. The deception damaged its international reputation.

On a general level, apart from the concrete economic, demographic and geographical circumstances, how countries deal with pandemics has indeed to do with political characteristics and the relationship of state and society. However, this is more about how it is concretely ruled, administered and communicated. There are democratic and authoritarian or half-democratic societies that managed the crisis well.

On a related manner, it is suggested that authoritarian and anti-democratic tendencies are strengthened in the crisis. Indeed, this is "the hour of the executive" with less time for parliamentary scrutiny. The Hungarian government has used the pandemic to declare a state of emergency. However, in most European countries a misuse has not been noticed – until now at least. As importantly, right wing populist parties have become less outspoken and face low voter preference, as their simplistic recipes do not address dealing with a concrete health crisis.

Recognition of research

With the rise of populist voices and parties in Europe (and beyond), the respect of

expertise had been questioned and often been discredited (e.g., in the run-up to the Brexit vote). In a distinct change, the voice of expertise on this pandemic is now valued by politicians as they crave for advice. The esteem of experts has also risen with the wider public.

It is also realised that a multidisciplinary approach to understand and effectively cope with the pandemic is needed. The insight of virologists, epidemiologists, other health specialists, economists, sociologists, political scientists, historians and others need to be combined and equally considered.

Open disputes between scientists are discussed in the public. The fact that scientific insights are not static but develop over time is realised. Another positive development is the wide acceptance of peer review and the open source principle.

Hope for a strengthened and more integrated Europe

In the beginning of the crisis, national governments reacted and regional responses were absent. In addition, some key elements of the EU integration were temporarily suspended – most notably, free movement was curtailed by the closing of a number of borders. This has been widely criticised. However, this criticism overlooks that health policy is not a mandate of the EU – it has firmly remained the responsibility of national governments.

On a general level, while a pandemic spread internationally, its effects are very different by location. So, while there is a need of international cooperation, the pandemic needs – first and foremost – local reaction and management. Generally, regional integration at the EU level does not mean that everything should best be dealt with at the regional level. This is why the EU operates with the principle of subsidiarity: highest possibility of self-determination and autonomy at regional or local level.

On a positive note, the reactions to the border closing by the population, in particular the youth, show the high degree of regional integration at the mental level. A large number of Europeans has experienced a travel-open Europe throughout their lifetime and is not willing to accept border limitations, except for emergencies.

In late May, regional integration returned to the policy level by cross-country assistance. The French-German proposal of a 750 billion euro ($826.5 billion) package for crisis-affected countries, financed by loans of the EU Commission, breaks taboos of regional debt. This was followed by a proposal of the EU Commission. If and when these proposals are adopted by the EU member states, it may eventually be a "Hamilton moment,"[8] leading to a significantly higher degree of regional integration complementing the monetary by a degree of fiscal union.

As observed in the past, crises give the momentum to deepen the EU integration – such integration did not arise from plans. Although a group of four Northern European "frugal states" are in opposition, the change of Germany's position may well bring the greater cross-region engagement. This change of the German position is highly significant. Germany is both the most populous country and has the largest economy; it is also in the centre of Europe and is very open and export oriented. The realisation that Germany's welfare is crucially dependent on the welfare and progress of its European environment has now firmly cemented itself in the consciousness of politicians and the majority of the population, and dominates the former conservative "frugal" view. On the European level, the consciousness is rising that maintaining the welfare and democratic governance in Europe cannot be achieved by the single nation states, but only by a more unified Europe.

An emerging new phase of international cooperation?

Due to the growing globalisation, states, economies and people are increasingly connected and depend on each other. The many gains and opportunities this delivers are widely appreciated. However, the benefits are not equally shared, and areas and people are marginalised, resulting, for example, in increasing migration and flight. Another downside of globalisation is that local and national crises like this COVID-19 pandemic can spread quickly worldwide. The increasing global integration reduces the sovereignty of nation states and exaggerates the need for

[8] Kaletsky, Anatole. 2020. "Europe's Hamiltonian Moment | by Anatole Kaletsky." Project Syndicate. May 21, 2020. https://www.project-syndicate.org/commentary/french-german-european-recovery-plan-proposal-by-anatole-kaletsky-2020-05?barrier=accesspaylog.

international cooperation and institutional governance. The financial crisis of the first decade, the impact of climate change and this pandemic have shown this drastically.

However, the multilateral institutional order with international organisations and rules established after World War II – and driven and financed to a high degree by the U.S. as the dominant world power – is fraying out. Underlying factors are the declining relative power of the U.S. and the rise of other powers, in particular China. The unwillingness of the current U.S. administration to support, and in cases even to recognise some multilateral organisations, is evidenced by the cases of the WHO, the WTO and the International Criminal Court. This comes at a time when the need for international cooperation is becoming more obvious by the day.

There are, however, signs that the pandemic may rejuvenate international cooperation. The consciousness of its need is growing and the need for cooperation is becoming apparent to many governments and people. In particular, the EU and China have vital interests to uphold and develop the multilateral system. At least in Europe, the conviction is growing that it will need to fight for it.

A realignment of Europe to the U.S. and China

As the U.S. and China – recognised as the most important nations – are locked in conflicts, the EU has to position itself in the conflict. One visible impact is the drive for higher regional integration in order to stand up to the conflicting interests of the two hostile blocks.

The distancing of the U.S. from Europe has arguably already begun at least under former President Barack Obama, who saw Asia as the emerging power and key area of interaction. The current U.S. administration sees Europe and the EU more as competitors than partners. The EU members are beginning to realise they must rely more on themselves with respect to security, build themselves as an economic block to compete and defend the democratic welfare model and fight for a multilateral world. Nevertheless, the EU and the U.S. share the same values of human rights, individualism and open society.

China has become a vital trade partner for Europe, and it is a partner to uphold and develop the multilateral world order. The EU recognises that the rising China

also needs to play a more important role in the multilateral order in line with its economic importance. At the same time, the EU and its member states recognise that the Chinese government will continue to pursue its objectives of regional and world power and to export its authoritarian governance model in an aggressive way. The EU needs to balance its economic interests and common interests with China with the firm upholding of high standards of democratic governance.

A new phase of Europe's relationship to Africa?

The impact of COVID-19 on Africa is not yet fully known. The fears of possibly devastating health effects have not yet borne out. It is not clear how the lower rate of tests in African countries disguised the true scale of the pandemic. Also problematic are the continent's relatively lower involvement in global trade and international travel, its hotter climate, or its possible better preparedness for such a viral outbreak because of experience with previous epidemics and regional cooperation.[9] In any case, the health systems of African countries are certainly less prepared for mass epidemics. But more important than the direct health effects for Africa are and will be the economic effects: lower demand for Africa's exports on world markets because of the recession, interrupted supply of imports, collapse of tourism, lower remittances, negative impacts on currencies and equity markets. The pandemic could even undo large parts of the high gains Africa made over the last decades in poverty reduction.[10]

In light of this, there are calls for the international community, and particularly the EU as the closest cooperation partner of Africa, to assist African countries on a larger scale to cushion the negative effects, or even to recalibrate the relationship between Africa and the EU. However, since the expiration of the 20-year Cotonous Agreement earlier this year – an agreement between the EU and African, Caribbean and Pacific Group of State countries designed to reduce poverty and

[9] Medinilla, Alfonso, Bruce Byiers, and Philomena Apiko. 2020. "African Regional Responses to COVID-19." ECDPM. May 18, 2020. https://ecdpm.org/publications/african-regional-responses-covid-19/.

[10] Kappel, Robert. n.d. "May 2020 AFRICA-EUROPE ECONOMIC COOPERATION Using the Opportunities for Reorientation." http://library.fes.de/pdf-files/iez/16251.pdf.; Wilkerson, Michael. 2020. "Will COVID-19 Derail the African Century? | by Michael Wilkerson." Project Syndicate. April 7, 2020. https://www.project-syndicate.org/commentary/mitigating-covid19-pandemic-in-africa-by-michael-wilkerson-2020-04?barrier=accesspaylog.

promote sustainability in development – there are at present numerous initiatives and negotiations on renewing the partnership. The pandemic crisis also taxes the limited capacity of African states to the maximum.

Most importantly, a balance needs to be stricken between meeting short-term emergency needs and the longer-term development drive of African countries, the core of which will be improving governance and improving the terms of international integration and deepening regional integration.

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COVID-19: Public Health and Lessons for Africa

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When the state rolled back funding for social services such as healthcare, education and housing under the neo-liberal Structural Adjustment Programs (SAPs) implemented from 1980 to 1999, healthcare standards in many African countries deteriorated, while the now-privatized healthcare services became unaffordable to the majority.[1] The poor were the most affected. The rich had the resources to seek treatment in local private healthcare institutions and in foreign countries with world-class hospitals staffed by well-trained and well-remunerated medical personnel.

A decade after the SAPs had run their predominantly devastating course in

[1] Kawewe, Saliwe M. and Dibie, Robert 2000. The Impact of Economic Structural Adjustment Programs [ESAPs] on Women and Children: Implications for Social Welfare in Zimbabwe. *The Journal of Sociology and Social Welfare* 27(4): 79–107.

countries such as Ghana and Zimbabwe, African governments pledged to channel more investment into healthcare. In the Abuja declaration of 2001, African leaders committed to increasing their national health budgets, pledging to allocate at least 15% of their annual budget to improve the health sector and urged donor countries to scale up support. They would renew this commitment in subsequent declarations, namely Ouagadougou (2009), Tunis (2012) and Luanda (2014). Budget allocation to public health is said to have increased over time in many African countries.[2] Countries such as Ethiopia, Côte d'Ivoire, Rwanda, Senegal, Ghana, Benin, Kenya, Uganda, Burkina Faso and Tanzania were forecast to experience a growth rate of between 6 and 8.5% for 2019.[3] In addition, calls for a complete overhaul or refurbishment of existing public health institutions, especially in the media and among ordinary citizens with online platforms from which to speak, have been growing in numbers.

Against this background, are these countries and the rest on the African continent now ready to deal with a pandemic with effects as cataclysmic as COVID-19?

COVID-19 provides a reality check on whether the commitment to invest more in healthcare, and the economic growth that has been witnessed in some countries, have translated into better public health systems for ordinary citizens, especially the poor. Have African countries gone far enough to be able to handle a disease as highly infectious as the coronavirus without external aid, which has hitherto been an integral component of the continent's fight against various calamities?

Although numbers of infections in the majority of African countries remain much lower than the projected worst-case scenario so far, the fact they are growing even at a relatively slow pace is worrisome, especially when COVID-19 has generally confirmed Africans' worst fears about their countries' preparedness for disease epidemics. In countries such as South Sudan and Zimbabwe, COVID-19 has exposed the persistent fragility of healthcare systems. It is surprising that a continent that has experienced epidemics and the more salient HIV/AIDS pandemic that exploded

[2] World Health Organization 2016. Public Financing for Health in Africa: From Abuja to SDGs. Geneva, Switzerland.

[3] Yinka Adegoke. Quartz Africa, "Africa will have some of the world's fastest growing economies in 2019—and a looming debt crisis." https://qz.com/africa/1522126/african-economies-to-watch-in-2019-and-looming-debt/ (accessed on June 03, 2020).

in 2001 has not done enough introspection and come up with strong healthcare systems. It also seems that countries that did not grapple with Ebola in recent years did not learn much from the experiences of those that did. Despite having a bit more time to prepare for coronavirus, many countries were caught almost flat-footed by the virus. Although there was general awareness in Africa of the sobering reality that not many countries could handle a disease as highly infectious as the coronavirus, reactions to the spectre of the virus infecting people on the continent have been varied. Countries such as Rwanda and Uganda immediately sprang into action to implement measures recommended for curbing the spread of the virus. In Senegal, scientists cranked up things in the laboratory as they worked hard to develop relatively affordable test kits. Madagascar courted controversy when it announced that it had found a cure in the form of what it termed COVID Organics.

As countries such as Rwanda and Senegal responded immediately through robust measures meant to curb the spread of COVID-19, health delivery systems across the continent came into the spotlight. It is now clear that many countries on the continent have a long way to go as far as healthcare provision is concerned. Voices that have been urging prioritization of public health systems while pleading for decent salaries for medical staff have gone largely unheeded by governments, some of whose leaders have externalized their healthcare needs to countries such as the United Kingdom, France, Germany, India, China and Singapore, among others.

As the rich normalize externalization of their medical needs, healthcare systems across the continent remain fragile. A considerable number of African leaders have died outside their own countries, and sometimes outside the continent altogether, while seeking specialized, world-class treatment. Examples include Gnassingbé Eyadéma of Togo, who died in 2005 on board a plane south of Tunis as he was being evacuated for medical treatment abroad; Levi Mwanawasa of Zambia, who died in France in 2008; and Robert Mugabe of Zimbabwe, who died in Singapore in 2019. African elites' quest for treatment outside the continent has become the norm, notwithstanding ordinary people's strident protests or muffled disapproval. Nigeria's President Muhammadu Buhari spent more than three months receiving treatment for an undisclosed "health challenge" in London, sparking protests by

Nigerians who wanted him to either return or resign.[4] Many political elites around the continent preside over healthcare systems in which they have no confidence, yet no state-of-the-art medical facilities are built in their countries each time they return from treatment on foreign soil. Africa's preparedness for COVID-19 or any other pandemic remains questionable as long as people tasked with ensuring this preparedness do not have vested interest in building systems that can offer a robust reaction to health crises.

Perhaps as a psychological way to cope with the anxiety driven by the knowledge that most African countries are ill-prepared to handle an infectious outbreak, bizarre claims racializing susceptibility to the virus swirled in the early stages of COVID-19, one of them being that Africans were immune to the coronavirus. When the disease landed in Africa, focus rapidly shifted from rumour and speculation to the sobering question of African countries' ability to handle the virus. As African countries started registering infections and putting in place measures to curb the spread of coronavirus, the shambolic state of healthcare systems in many of these countries was unmasked. People learned that the virus caused severe respiratory problems, which made ventilators one of the main topics of discussion. As evidenced by the insufficient numbers of ventilators, it became clear that many countries were not prepared for the virus, despite pronouncements to the contrary. This remains a cause for concern as numbers of infections spike. Inadequate testing is making it difficult for countries to determine the extent to which they have been affected, thus placing them in a quandary: Maintaining the lockdown means the poor who draw livelihoods from the informal sector will suffer, and lifting the lockdown without adequate information on infections means reversal of the gains made through the lockdown.

The degree of exposure to the virus varies on the basis of adherence to the recommended safety measures, living conditions and socioeconomic status. However, once infected, who dies becomes a matter of both the individual's physical capacity to fight the disease and the quality of healthcare provided. In this respect, COVID-19 does not attack with an eye on class or status; since many

[4] Al Jazeera, 19 August 2017. "Buhari Returns after Lengthy UK Medical Treatment." https://www.aljazeera.com/news/2017/08/nigeria-buhari-return-lengthy-uk-treatment-170819134302820.html (accessed June 03, 2020).

countries frequented by Africans for medical treatment have closed their borders, what does this mean for them?

The irony of COVID-19 is that its rapid spread through global mobility, which prompted closing of international borders and global restrictions on international travel, means that African elites who become infected are not able to travel to their preferred foreign destinations for treatment. Suddenly, the rich face the same spectre as the poor in terms of seeking treatment in the same country for a disease that transcends socioeconomic status, privilege and class boundaries. At a time when the closed borders mean money can no longer buy health, it is dawning on many elites that their fate is inextricably linked with that of the poor who work in their homes providing domestic and security services. Infections in poor neighbourhoods can migrate to affluent neighbourhoods, and vice versa. The rich who are accustomed to world-class treatment in foreign countries are now faced with the unsavoury prospect of being treated in the same local healthcare institutions they have normally avoided. Once again, the question of ventilators, competence of medical staff and availability of necessary drugs becomes too urgent; if numbers of infections keep rising, the implications are too ghastly to ponder.

COVID-19 also shows that healthcare is not only about building well-equipped and staffed health institutions. Deprivation and denial of basic needs such as clean water and decent housing have negative implications on health. For instance, personal hygiene involving frequent hand washing and social distancing are among the key global safety measures recommended by the World Health Organization and Centers for Disease Control and Protection. For people living without a dependable supply of clean water in overcrowded spaces and structures, how do they adhere to guidelines on personal hygiene, social distancing and self-isolation? For many citizens in African countries, the terms lockdown, social distancing and self-isolation are contradictions; a lockdown, a shelter-in-place directive, makes social distancing impracticable where large numbers of people reside in the same space. There are also no rooms for self-isolation in the overcrowded dwellings. The irony in this situation is that poor urban dwellers can only maintain social distancing in their homes by breaking the lockdown and going outside. For those who do not have much space around their dwelling, this means going into the streets where

the police, and in some instances the army, wait to mete out punishment for defying the lockdown. It should have been clear from previous disease outbreaks such as cholera and typhoid that sanitation, availability of clean drinking water and decent accommodations are integral to citizens' health.

One of the major lessons of COVID-19 in Africa and, indeed, the world, is that the state of any nation's healthcare system is the state of every citizen's health and prospects for recovery after infection. Healthcare must be prioritized, and governments must invest more and provide universal healthcare. Entrusting citizens' healthcare needs to the free market on a continent where many people cannot afford treatment for even mild ailments spells disaster in the event of diseases as brutal as COVID-19. Fragile healthcare systems reflect the widening gap between the rich few and the majority poor, who wallow in desperate material conditions; these weak systems are dangerous during pandemics such as COVID-19. The free market only widens the gap between the rich and the poor in terms of access to healthcare. The fragility of health-care systems existing on the continent means that infectious diseases, if not properly managed, will affect the poor more. And this will ensure that, contrary to the adage that death is the greatest equalizer, death will be the end result of socioeconomic inequality.

Many Africans earn their livelihoods in the informal sector's crowded markets. Diseases such as COVID-19 should jolt African governments into establishing the necessary preventive measures for future disease outbreaks, whether that be another round of COVID-19, a new pandemic/epidemic or those health events the continent has grappled with before. Considering the latter and the fact that the continent was among the last regions to be affected, African countries should have been the first to reduce international traffic or engage in thorough screening and isolation measures.

With the frailty of healthcare systems on the continent, Africa should understand, better than many other regions, that prevention is better than cure. As noted above, this prevention starts with acknowledging that clean water and decent living conditions are exactly what their classification suggests – basic. The poor who constitute the majority in many countries on the continent cannot afford to meet their basic needs without government intervention. It follows, therefore, that if governments do not intervene to ensure that these needs are addressed

and met, prevention will be difficult and infections that could easily be contained could become widespread. Since most African countries can hardly afford such a huge investment, failure to start from the basics could spell disaster for the continent, now and in future.

Equally important is the need for Africa to wean itself from dependence on aid and donations. The usual donor countries are currently overwhelmed by the impact of the coronavirus and are giving primacy to domestic solidarity over international solidarity as each country focuses on getting better first. It also turns out that the Western countries Africa often taps for aid are among the most affected. For many of these countries, humanitarianism toward Africa is difficult to prioritize when the situation at home is dire and overwhelming. As these countries struggle to treat their infected and flatten their still-growing case curves, they can hardly be amenable to the idea of accepting foreign patients who are fleeing decrepit healthcare facilities in their own countries.

It is time for Africa to be proactive and to actively participate in finding solutions for itself instead of waiting for richer nations to assist. The continent can no longer afford to rely on handouts after the uncertainty that COVID-19 has generated on a global level. Although COVID-19 has provided lessons on the need for well-maintained public health systems in Africa, it remains to be seen whether the continent will finally learn the lessons the pandemic has so cruelly provided. In countries such as Zimbabwe, lessons from prior outbreaks of cholera and typhoid go forgotten once the outbreaks are contained; the cycle repeats itself. As each country looks for coping mechanisms tailor-made to its health needs and economic dynamics, it can only be hoped that African governments will adequately prepare for what could come next: another COVID-19 outbreak or any other pandemic that may follow COVID-19, be it previously experienced or novel.

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Jailed: COVID-19 Puts Correctional System Behind Bars

Image credit: Jim Lambert / Shutterstock.com

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The criminal justice system in the United States is broadly divided into three interrelated segments: law enforcement, judicial and corrections. All three components require close communication and physical contact between a variety of people. The level of interpersonal contact and activities reflects the human aspects of the American criminal justice system – at the same time, that human aspect is highly vulnerable to any form of infectious disease. Most people employed in or moving through the American justice system understand this and during the current COVID-19 pandemic use some level of PPE – personal protective equipment – hand sanitizer, gloves, mask or other such tools when able to do so. This human contact and an imperfect system of protection, combined with a population unable to maintain "perfect" hygiene or without access to protective equipment, exacerbate the chance of disease spread when the agent of infection can be transmitted by casual contact.

The 2020 coronavirus health crisis has highlighted an intractable weakness in public health measures – the lack thereof – in the justice system and has resulted in much-needed fundamental changes in the operations of each major component within the system.

In simple terms, law enforcement is a group of agencies and personnel responsible for the prevention of crime, the maintenance of peace and public order, and the apprehension of alleged offenders – think police departments and sheriff's offices. The next component in the system is the judiciary. The courtrooms fill with prosecuting and defending attorneys, judges and related personnel who "administer" justice according to a system of penal laws, procedural rules and case precedents. The judiciary is the intermediary between law enforcement and corrections components. Law enforcement agencies arrest alleged offenders, gather evidence, present the offenders to the courts, and provide evidence to the prosecutors. The judiciary hears cases and turns adjudicated defendants whose cases result in correctional sanctions over to the correctional phase. Corrections is a system of custodial and community corrections that enforces the penalties or other results of the court's adjudicatory processes. For offenders under a sentence of incarceration, corrections facilities hold the convicted in a jail or prison for a period that varies with a range of factors. Other offenders with non-incarceration sanctions are supervised in the community by a probation agency.

Consider the bubble of contact as people move through the criminal justice system in each municipality across the country. Thousands of people move through this system, from street to law enforcement lock-up facility, to the courthouse and back to the street or off to incarceration. Moving with them are law enforcement officers, attorneys, judges, police and courthouse support staff, victims, witnesses, friends and family who travel along through the process, from venue to venue.

All three phases of the American criminal justice system are "hands on." Law enforcement officers are in close contact with each other and the public, and also in physical contact with offenders taken under arrest. In the courts, prosecutors meet with police officers, witnesses, victims and each other; defense attorneys meet with new defendants, friends and family of those in court, and witnesses. Pretrial service staff and prosecution support staff meet defendants, witnesses,

victims, prosecutors and defense attorneys, according to the varied roles they play.

The rise of COVID-19 in the United States has now inserted itself into all these human interactions. The response to COVID-19 has varied widely by onset, tactics, logistics and the realities of each entity's operational, legal and constitutional roles, as well as the realities of the novel coronavirus.

For law enforcement agencies – those agencies with significant public exposure that provide the necessary operations for public safety 24 hours daily, 7 days a week, 365 days day a year – the realities of COVID-19 were immediate. As first responders, law enforcement officers and their activities naturally result in a high level of physical interaction – so much so it has been referred to, in jest, as a "contact sport."[1] Law enforcement officers are called to fires, road closures, medical emergencies and crime situations. Now, since the onset of COVID-19, departments have continued to provide policing services but have closed down or substantially limited public access to their stations to minimize transmission between officers and the public. This approach has been taken, for example, in areas in Florida, Illinois, Maryland, Oregon and California.

At the same time police have restricted civilian access to law enforcement facilities, police departments have made tactical choices to reduce direct personal contact with the public, some making policy decisions to reduce arrests in favor of citations. Such citations have allowed lower-level and nonviolent suspects to appear in court at a later date in Miami; Rockford, Illinois; Philadelphia; Los Angeles; and Fort Worth, Texas.[2] Other contact-limiting practices have included warning people rather than arresting (San Francisco) and not issuing parking and traffic citations when public safety is not at issue (Philadelphia and Chicago).[3]

[1] Rosa Brooks, "Police officers nationwide need to consider going hands-off during this crisis," (April 24, 2020); https://www.washingtonpost.com/opinions/2020/04/24/this-pandemic-standard-police-practices-risk-spreading-infection/.

[2] Aaron Stagoff-Belfort, "Law Enforcement Best Practices Can Help Halt the Spread of COVID-19 by Keeping People Out of Jail," (March 27, 2020); https://www.vera.org/blog/covid-19-1/law-enforcement-best-practices-can-help-halt-the-spread-of-covid-19-by-keeping-people-out-of-jail.

[3] Brennan Center for Justice, "Police Responses to Covid-19," (March 27, 2020); https://www.brennancenter.org/our-work/research-reports/police-responses-covid-19.

Some agencies have gone a step further, announcing they would "no longer (be) sending officers to take incident reports for certain low-level offenses" and instead referring callers to provide information through "their online reporting portal."[4] Some departments have gone even further, implementing changes to reduce the number of officers appearing in their stations: roll calls held in the field, electronic sharing of information, or suspending roll call procedures altogether[5]. These changes in practice have reduced arrests in some jurisdictions by more than 75% and helped reduce the flow of offenders through local detention facilities and courthouses.[6]

Not all law enforcement agencies have changed their approach to arrests and detention during the pandemic. Some agencies have maintained their rate of custodial arrests, despite the increased risk of infection of all involved in such events. Police and sheriff's deputies in San Diego continued to make arrests for nonviolent and minor misdemeanors; more than one in every four bookings was for someone accused of minor and nonviolent crimes, including 580 arrests for "public intoxication" from March 12 to April 30, 2020.[7]

The reduction in numbers of people driving their cars, shopping at malls, attending events and generally doing their business has changed the calculus of crime. Crime is the combination of three factors: a willing offender, an available target and an opportunity or motive. Shelter-in-place efforts to limit the spread of COVID-19 have nearly eliminated the three ingredients in many areas,[8] but not in all.

[4] Aaron Stagoff-Belfort, "Law Enforcement Best Practices Can Help Halt the Spread of COVID-19 by Keeping People Out of Jail," (March 27, 2020); https://www.vera.org/blog/covid-19-1/law-enforcement-best-practices-can-help-halt-the-spread-of-covid-19-by-keeping-people-out-of-jail.

[5] Aaron Stagoff-Belfort, "Law Enforcement Best Practices Can Help Halt the Spread of COVID-19 by Keeping People Out of Jail," (March 27, 2020); https://www.vera.org/blog/covid-19-1/law-enforcement-best-practices-can-help-halt-the-spread-of-covid-19-by-keeping-people-out-of-jail.

[6] Brennan Center for Justice, "Police Responses to Covid-19," (March 27, 2020); https://www.brennancenter.org/our-work/research-reports/police-responses-covid-19.

[7] Kelly David, Lauryn Schroeder, and Jeff McDonald, "Despite pandemic, sheriff continues booking suspects on minor, nonviolent offenses," (May 17, 2020); https://www.sandiegouniontribune.com/news/watchdog/story/2020-05-17/despite-pandemic-sheriff-continues-booking-suspects-on-minor-nonviolent-offenses.

[8] Neil MacFarquhar and Serge Kovaleski, "A Pandemic Bright Spot: In Many Places, Less Crime," (May 28, 2020); https://www.nytimes.com/2020/05/26/us/coronavirus-crime.html.

Even though arrests were down 73% in Chicago, the 2020 Memorial Day weekend drew people from their homes and witnessed the largest number of homicides in the city in five years. Some areas experienced ups and downs: Crime dropped in tourist- and retail-related categories in New York City, but increased in its suburbs. The Big Apple saw a 21% drop in crime overall, but burglaries and car thefts jumped approximately 68% over the prior year.[9] Another example: In Baltimore, while most offenses reported dropped, residential robberies jumped, like New York, by nearly 75%.[10]

Additionally, other forms of crime – those committed out of the public view – have skyrocketed. Reports of online abuse of children soared from a monthly rate of one million reports in April 2019 to more than four million reports in April 2020.[11] Domestic violence hotlines and law enforcement agencies fielded significantly more calls than in similar timeframes. At the same time, sadly, domestic violence hotlines and shelter agencies reported an inability to effectively fundraise. Many experts in social work and public safety anticipated the rise in criminal incidents – a result of school and business closures and job losses, toxically mixed with the financial and interpersonal challenges that shadow such life changes.[12] These "invisible" crimes, unlike street crime offenses, are where the calculus of offenders, victims and opportunities have grown during the pandemic.

All the arrests, citations and orders to appear on the various offenses discussed above ultimately result in an appearance for the offender in criminal court. The courts have taken a mixture of approaches around the nation, based on a variety of factors. Some courts closed completely, other courts were open with

[9] Neil MacFarquhar and Serge Kovaleski, "A Pandemic Bright Spot: In Many Places, Less Crime," (May 28, 2020); https://www.nytimes.com/2020/05/26/us/coronavirus-crime.html.

[10] Andrew Vaught and Joyce Iwashita, "Police data behind the pandemic response," (May 19, 2020); https://www.policeone.com/police-products/software/data-information-sharing-software/articles/police-data-behind-the-pandemic-response-HZfFY3THMdI3hHa7.

[11] Fernando Alfonso III, "The pandemic is causing an exponential rise in the online exploitation of children, experts say," (May 25, 2020); https://www.cnn.com/2020/05/25/us/child-abuse-online-coronavirus-pandemic-parents-investigations-trnd/index.html.

[12] Tyler Kingkade, "Police see rise in domestic violence calls amid coronavirus lockdown," (April 5, 2020); https://www.nbcnews.com/news/us-news/police-see-rise-domestic-violence-calls-amid-coronavirus-lockdown-n1176151.

limited staff to hear emergency matters only, and other courts opened only by videoconference.

Unlike other government and business operations, there are time limits and rules that apply to criminal cases, dictated by a combination of statutory and constitutional standards and the presumption of innocence. The constitutional right to a speedy trial has been suspended in many states by government decree in recognition of the practical issues of bringing groups of police officers, witnesses, defendants and jurors together in the confined spaces of the courtroom.[13] For defendants held on high bail or a detainer, these delays have caused harm from loss of work and time with family, and impaired efforts to prepare for court hearings and trial; they are "dead time" of no value to anyone. Many jurisdictions, therefore, have turned to videoconferencing for first appearances, arraignments, bail hearings, motion hearings and even trials.[14]

While this approach has provided a level of convenience and reduced costs in some areas, the judicial system has been resistant to remote hearings and trials because of the "unique benefits of physical presence" afforded the parties.[15] Another consideration is the concern that video does not fulfill the requirements of the Sixth Amendment's Confrontation Clause, which holds, "in all criminal prosecutions, the accused shall enjoy the right … to be confronted with the witnesses against him."[16]

Some criminal courts have opened for limited purposes or under COVID-related restrictions. In Seattle, the federal courts have physically closed but have handled matters by phone or videoconference. The Washington state courts have been open for business with all parties wearing

[13] Toni Messina, "'When Will I Get My Trial?' Being a Criminal Defense Attorney During COVID," (June 1, 2020); https://abovethelaw.com/2020/06/when-will-i-get-my-trial-being-a-criminal-defense-attorney-during-covid/.

[14] Michael Water, "Video-Chat Juries and the Future of Criminal Justice," (May 21, 2020), https://www.wired.com/story/video-chat-juries-and-the-future-of-criminal-justice/amp.

[15] Michael Water, "Video-Chat Juries and the Future of Criminal Justice," (May 21, 2020), https://www.wired.com/story/video-chat-juries-and-the-future-of-criminal-justice/amp.

[16] Legal Information Institute, "Right to confront witness," (retrieved June 14, 2020), https://www.law.cornell.edu/wex/right_to_confront_witness.

masks, the judge sitting behind a partition and some attorneys present through videoconferencing, while those lawyers in attendance sit next to each other. Jury trials have been suspended at least until July 6.[17] Similar closures exist with equally similar stop-gap measures of phone or videoconference hearings in courtrooms across Massachusetts, Florida, Rhode Island,[18] North Carolina,[19] Texas, Virginia, Kentucky, Nevada, and beyond.

The federal government's judiciary response has included an effort to extend the statute of limitations for "one year following the end of the national (COVID) emergency" as blanket language for this and any future national emergency. Proposed, and immediately rejected, was a similar suspension of all statutes and rules of procedure that would have the effect of suspending all mandatory and constitutional obligations, including pre-arrest, post-arrest, pretrial, trial and post-trial procedures. The ill-fated idea would hold in abeyance all habeas corpus, speedy trial, appeal rights, and would allow a judge to order any person arrested held until said emergency has passed. Such a provision flies in the face of any semblance of constitutional criminal procedure or basic concepts of due process.

While no similar provision is known to be proposed or pending in any of the 50 states, this does not mean that the states have scrupulously followed their own statutory or constitutional criminal procedure standards. Attorneys for defendants held on bail, detainers or who have been sentenced are finding their clients are being held, when they are instead due for release, because of miscommunication between courts and jails or inattention to documents for release and more. The attorneys are finding it difficult to get into court and these defendants end up held over for days and weeks until the messes can be resolved.[20] Additionally, as is likely

[17] Mike Carter, "How Will Washington's Justice System Return After COVID-19?," (June 2, 2020); https://www.govtech.com/public-safety/How-Will-Washingtons-Justice-System-Return-After-COVID-19.html.

[18] Katie Mulvaney, "Justice goes high-tech in R.I. courthouses amid coronavirus restrictions," (May 20, 2020); https://www.providencejournal.com/news/20200519/justice-goes-high-tech-in-ri-courthouses-amid-coronavirus-restrictions.

[19] Josh Shaffer, "NC again postpones all jury trials, court deadlines extended amid coronavirus pandemic," (May 21, 2020); https://www.newsobserver.com/news/state/north-carolina/article242891156.html.

[20] Jackson Cote, "'The stress, the fear, the desperation': Coronavirus crisis poses obstacles for Massachusetts public defenders as they represent their clients remotely," (May 15, 2020); https://www.masslive.com/springfield/2020/05/the-stress-the-fear-the-desperation-coronavirus-crisis-poses-obstacles-for-massachusetts-public-defenders-as-they-represent-their-clients-remotely.html.

in other courts and states, there is already a trio of cases consolidated on appeal before the Massachusetts Supreme Judicial Court about the rights of defendants held beyond statutory limits on bail revocations and pending trial while held on detainers unrelated to the conduct of the trial.[21]

Courts that are holding trials have taken one of two tracks during the pandemic. The Wall Street Journal reported in a May 19, 2020, article, "Is Anywhere Safe for a Jury Trial During the Covid-19 Pandemic," that in Lincoln County, Montana, a local school gymnasium serves as the forum for a jury trial – an unlikely venue in normal times, but one that, under the circumstances, provides adequate space to empanel 12 jurors six feet apart, with similar distancing for witnesses, counsel and gallery. The Journal goes on to note that while Los Angeles County in California announced a plan to reopen its courts in late June with distancing measures in place and sanitizing practices assured, Texas holds videoconference jury trials with nonbinding verdicts.

Many other states are reporting that jury trials remain months off; courts are holding binding criminal jury trials but finding new issues. In Minnesota, the first jury trial since the onset of the pandemic resulted in quarantine for several of the parties as one of the courtroom staff was discovered to be infected shortly after the case was heard.[22] In Texas, a juror walked off-camera to take a phone call during jury selection and could not hear the judge call him back to the proceedings.[23] Such issues of inattention or collateral activities are not limited to the jurors. In proceedings before the United States Supreme Court, it has been asserted that one of the justices, hearing the matter from a location other than the courthouse, went to the restroom during arguments, and that a "flush" could be heard. In circumstances that sound an alarm to parties involved in future

[21] Andrew Zeiberg (attorney) in discussion with the author, June 2020.

[22] Rochelle Olson, "First Hennepin County trial since pandemic results in quarantine for judge, staff," (June 11, 2020); https://m.startribune.com/first-hennepin-county-jury-trial-since-pandemic-results-in-quarantine-for-judge-and-her-staff/571165002/.

[23] Angela Morris, "Juror Walks Off To Take Phone Call as Texas Tests First Jury Trial Via Zoom," (May 18, 2020); https://www.law.com/texaslawyer/2020/05/18/juror-walks-off-to-take-phone-call-as-texas-tests-first-jury-trial-via-zoom/.

telephonic court proceedings, one media outlet publicly speculated which justice was the culprit, and in satirical tones provided the evidence for the conclusion reached.[24] In contrast to the arguably humorous aspects of the Supreme Court proceedings, on the other side of the world, Singapore has been actively using videoconferencing in serious criminal cases, and recently – during proceedings conducted by videoconferencing – sentenced a high-level drug dealer to death.[25]

Jails and prisons are places of close confinement for approximately 2.3 million people in America.[26] This final stop in the criminal justice system is a line item on a budget that is perennially underfunded. Jails and prisons do not have the required funding to provide top-notch medical care or the necessary cleaning and maintenance care, and even less budget room for soap, PPEs or hygiene products. There are three groups that come into these facilities – prisoners, staff and visitors. All three are vectors for infection. All three groups pass from the outside into the facility with no effective barriers to viral transmission. Prisoners stay inside, but corrections staff leave each day and return with the potential to transmit the virus. Only visitors can be controlled; limited admittance or total exclusion. Unlike police departments and courts, jails and prisons cannot shut down or do their business by computer or videoconference. During the pandemic, they have "shut down" what they can – visitors.

The same challenges have presented – but in many cases have been exaggerated – in managing exposure to COVID-19 in the corrections arena: There have been few or no masks or gloves available to prisoners or guards, social distancing is inherently difficult in such quarters and hand sanitizer supplies and soap[27] are considered contraband for prisoners. In short, prisoners have been at a

[24] Ashley Feinberg, "Investigation: I Think I Know Which Justice Flushed," (May 8, 2020); https://slate.com/news-and-politics/2020/05/toilet-flush-supreme-court-livestream.html.

[25] John Geddie, "Man sentenced to death in Singapore on Zoom call," (May 20, 2020); https://www.reuters.com/article/us-singapore-crime/man-sentenced-to-death-in-singapore-via-zoom-call-idUSKBN22W0I6.

[26] Wendy Sawyer and Peter Wagner, "Mass Incarceration: The Whole Pie 2020," (March 24, 2020); https://www.prisonpolicy.org/reports/pie2020.html.

[27] Keri Blakinger and Beth Schwartapfel, "Soap and sanitizer can keep coronavirus at bay, but many prisoners can't get them," (March 9, 2020),; https://www.usatoday.com/story/news/investigations/2020/03/07/prison-policies-inmates-best-coronavirus-practices/4978412002/.

disadvantage when it comes to the ability to follow good hygiene practices or have optimum health.[28] Additionally, some jails and prisons are historically vulnerable to virus exposure and spread. To add insult to injury, guards have been ordered to report to work regardless of their COVID-19 status.[29] Further, rather than working to increase hygiene and cleaning practices, some correctional facilities have suspended showers for inmates suspected of having the coronavirus or who have been in medical quarantine.[30] In another instance of the seemingly absurd, one Arizona prison is so short of recommended cleaning supplies, prisoners have been provided shampoo, hand soap and even menstrual pads to clean their living quarters.[31] In many facilities, more than 80% of the prisoners and many of the staff have tested positive for the COVID virus.[32] With the challenges of being unable to practice social distancing, don protective masks and exercise the precautions that have allowed the general population to "flatten the curve" and reduce the spread, prisons and their populations have continued to witness an increase in cases and believe the peak of infection had yet to occur as of April 1.[33]

Most jurisdictions have made efforts to reduce their prison head counts and reduce the risk of direct infection, probability of death, costs of healthcare and

[28] Kimberly Kindy, Mark Berman, and Julie Tate; "Jails and prisons suspend visitation to keep coronavirus from spreading," (March 17, 2020); https://www.washingtonpost.com/national/jails-and-prisons-suspend-visitation-to-keep-coronavirus-from-spreading/2020/03/16/0cae4adc-6789-11ea-abef-020f086a3fab_story.html.

[29] Samantha Michaels, "Arkansas Told Corrections Officers to Keep Working Even If They're Infected with COVID-19," (June 2, 2020); https://www.motherjones.com/crime-justice/2020/06/arkansas-told-corrections-officers-to-keep-working-even-if-theyre-infected-with-covid-19/.

[30] Kelan Lyons, "Connecticut Department of Corrections suspends showers for inmates in quarantine or medical units," (May 13, 2020); https://www.courant.com/coronavirus/hc-news-coronavirus-prisons-showers-20200513-utdbny4j4rff5dzzhlvjxb572m-story.html.

[31] Meg O'Connor, "Cleaning Supplies Are So Scarce At This Arizona Prison, Detainees Are Using Shampoo And Menstrual Pads, Lawsuit Says," (May 12, 2020); https://theappeal.org/florence-correctional-complex-lawsuit-arizona-coronavirus/.

[32] Meg O'Connor, "Cleaning Supplies Are So Scarce At This Arizona Prison, Detainees Are Using Shampoo And Menstrual Pads, Lawsuit Says," (May 12, 2020); https://theappeal.org/florence-correctional-complex-lawsuit-arizona-coronavirus/.

[33] Gabrielle Banks and St. John Barned-Smith, "A COVID-19 outbreak at Harris County Jail was the 'nightmare scenario.' Then it actually happened," (May 21, 2020); https://www.houstonchronicle.com/news/investigations/article/Harris-County-jail-coronavirus-covid-spread-inmate-15283248.php.

virus transmission to staff.[34] From these circumstances emerges a variety of responses: early release of prisoners near the end of their sentences, release to home confinement, release on health or humanitarian grounds, compassionate release and lawsuits seeking either better conditions or release. Despite these efforts, nationwide few prisoners have been released, regardless of the mechanism or conditions, especially from federal facilities.

None of these issues have come as a surprise to correctional facilities. In fact, speculation about the "nightmare" of a viral infection has projected that hundreds of thousands could die, and that the correctional population could spread the virus to surrounding communities.[35] Such an outbreak, even if contained within the facility, would rapidly overwhelm internal health systems and this additional venue strain would spill over to local civilian health facilities and further spread an infectious agent.[36] Those concerns came to the fore in May in Oregon where one maximum security facility became the state's single largest viral outbreak center, eclipsing all nursing homes, hospitals or other groups or facilities.[37]

Across the nation, all aspects of criminal justice, law enforcement, courts and corrections are close-contact activities where people are frequently in physical contact or even chained to each other or immobilized and unable to maintain safe distancing practices. The coronavirus does not recognize lawful from unlawful, offender from police, assailant from victim, in any form. The close quarters position the criminal justice system as an accommodating breeding and transmission environment for COVID-19. Efforts to reduce the flow of people, the

[34] Blake Nelson, "N.J> Supreme Court could release more prisoners as coronavirus cases rise behind bars," (May 27, 2020); https://www.nj.com/coronavirus/2020/05/nj-supreme-court-considers-releasing-more-prisoners-as-coronavirus-cases-rise-behind-bars.html.

[35] German Lopez, "A coronavirus outbreak in jails or prisons could turn into a nightmare," (March 17, 2020); https://www.vox.com/policy-and-politics/2020/3/17/21181515/coronavirus-covid-19-jails-prisons-mass-incarceration.

[36] German Lopez, "A coronavirus outbreak in jails or prisons could turn into a nightmare," (March 17, 2020); https://www.vox.com/policy-and-politics/2020/3/17/21181515/coronavirus-covid-19-jails-prisons-mass-incarceration.

[37] Neil Crombie, "Oregon's maximum-security prison in Salem now the site of state's biggest single coronavirus outbreak," (May 22, 2020); German Lopez, "A coronavirus outbreak in jails or prisons could turn into a nightmare," (March 17, 2020); https://www.vox.com/policy-and-politics/2020/3/17/21181515/coronavirus-covid-19-jails-prisons-mass-incarceration.

level of close human interaction and the extent of person-to-person contact are required but also defeat the operational charter of public safety agencies, judicial facilities, jails and prisons.

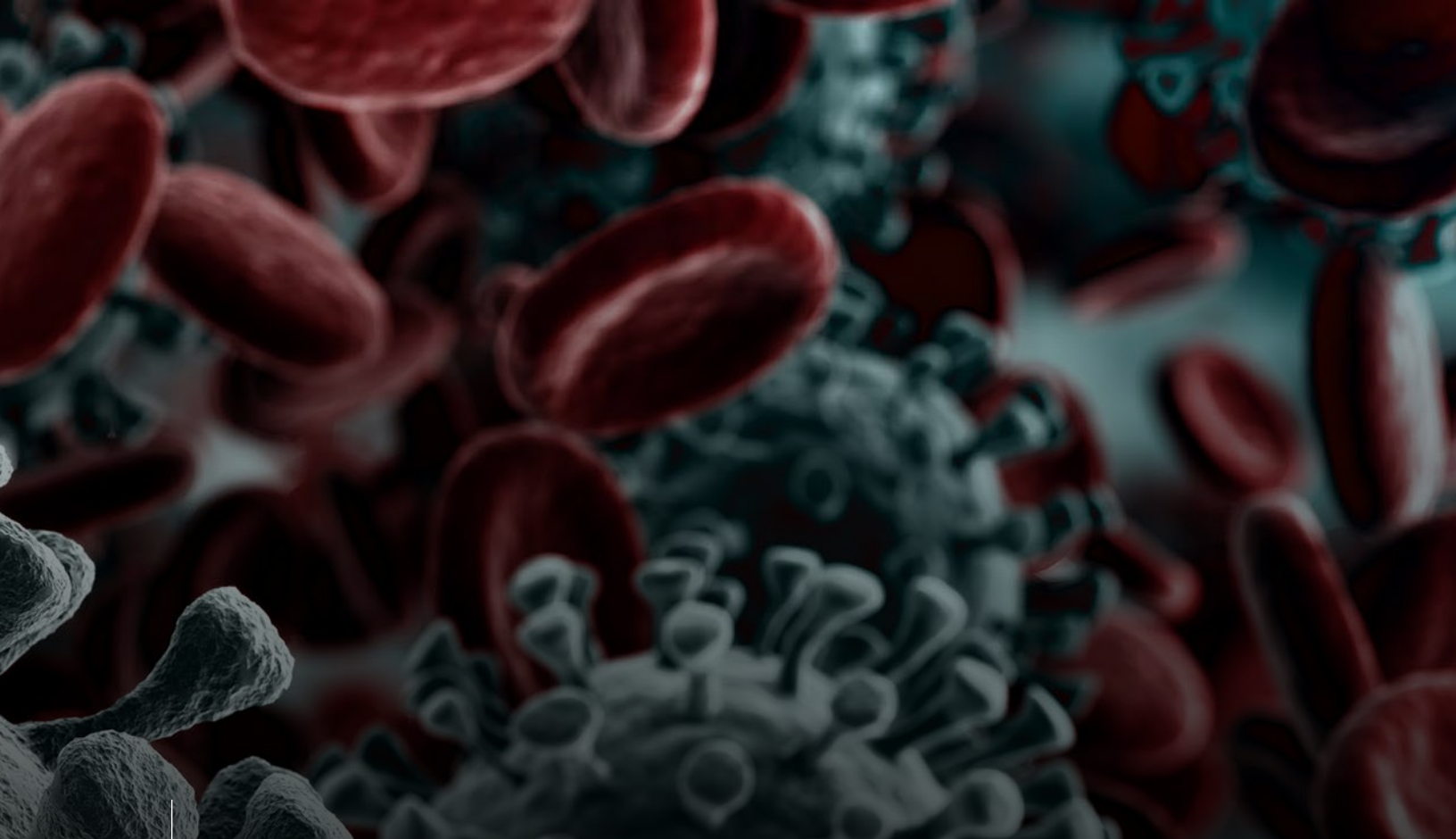
In the absence of herd immunity or the rollout of an effective vaccine to protect people from infection, this virus will continue to easily spread in the criminal justice population, and from there into the rest of America without barriers – crushing the criminal justice system along with the health and economy of the nation.

About the Author

Paul R. Gormley received his Juris Doctor degree from New England Law in Boston in 1996, and his doctorate in law and policy from Northeastern University in 2012. He has previously held faculty positions at North Shore Community College in Danvers, Massachusetts, and the University of Massachusetts at Lowell. He is currently a professor of criminal justice administration and chair of social science at Lynn University in Boca Raton, Florida.

Gormley opened his own office and practiced law for nearly 20 years, focusing on the representation of indigent criminal defendants, individuals with mental health issues and convicted sex offenders before the Massachusetts Sex Offender Registry Board. Based on his experience in legal practice, his doctoral research focused on defense counsel and issues of effective representation of mentally ill criminal defendants.

Since joining the faculty at Lynn University, Gormley has given numerous presentations at conferences on issues of criminal justice, academic assessment and student writing development. He has provided training sessions on diverse topics, including academic assessment by college faculty, effective representation of sex offenders in classification hearings for defense counsel and supervision of cybercrime offenders by probation officers.



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The Zambakari Advisory provides sustainable solutions to complex problems facing societies around the world in the areas of peace, security and economic development through in-depth research. The Advisory collects and analyzes data and strategic intelligence to equip industry senior leadership with tools and insights that can help them operate in increasingly complex environments. By leveraging the knowledge and talents of local and international subject matter experts, The Advisory delivers incisive, invigorating and tailored solutions that address the specific needs of our clients.

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- "The Great Disruption: COVID-19 and the Global Health Crisis," 2020
- "The Kurdish Crisis in the Middle East," 2020
- "Courting Africa: Asian Powers and the New Scramble for the Continent," 2020
- "The Future and Implementation of the R-ARCSS in South Sudan," 2020
- "Peacemaking and Peace Agreements in South Sudan," 2020
- "The Cost of Violence and the Business of Peace," Phoenix 100 Rotary Club, Arizona, 2019
- "Peace in a Globalizing World," Baton Rouge, Louisiana, 2019
- "Making Sense of Africa in a Globalized World," Glendale Community College's Pathway to Africa, Glendale, Arizona, 2018
- "Somalia in the Age of the War on Terror: An Analysis of Violent Events and U.S. Covert Operations," 2017
- "China's Influence in South Sudan: Prospects and Challenges," 2017

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- "The Great Disruption: COVID-19 and the Global Health Crisis," 2020
- "The Role of the UN Mission in South Sudan (UNMISS) in Protecting Civilians," 2018
- "An Analysis of Political Violence in South Sudan," 2011-2016
- "Suicide Attacks in Nigeria, 2014-2015," 2016
- "Instability in the Greater Niger Delta Region of Nigeria: An Analysis of Violent Events," 2011-2015

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Conflict is the end result of powerful influences, from system polarity to outside intervention, from opposing interests to socio-cultural dissimilarity and more. The contributions of The Advisory to the international discussion include influential explorations and answers driven by real-world data:

- "Whose Peace, Which Justice?" City of Peoria, Arizona, 2019
- "The Cost of Violence and the Business of Peace," Phoenix 100 Rotary Club, Arizona 2019
- "To Punish or to Reform? Survivor Justice in Africa," 2016
- "The Misguided and Mismanaged Intervention in Libya," 2016
- "Sequences of Transitional Processes: A Democratic Journey?" – for the Berghof Foundation in support of conflict transformation, 2015
- "Nation and State-Building in South Sudan: Identity, Violence and Democracy," University of Washington, Seattle, 2014
- "Political Drivers of Violence and the Challenge of Democratic Nationbuilding," 2013

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